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March 15-19, 1954

ELEVATED TEMPERATURE CORROSION SYMPOSIUM, Municipal Auditorium, Kansas City, Mo. Sponsored by: National Association of Corrosion Engineers – 10th Annual Conference

Person to Contact: Glenn A. Fitzlen
Ass't. Technical Director
Haynes Stellite Co.
Kokomo, Ind.

June 20-25, 1954

NUCLEAR ENERGY CONFERENCE, University of Michigan, Ann Arbor, Michigan, Sponsored by: American Institute of Chemical Engineers.

Inquiries should be addressed to: Professor Donald Katz, University of Michigan, Department of Engineers, Ann Arbor, Michigan.

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AECD-3545 5736
Radiation Lab., Univ. of Calif., Berkeley
LIQUID-LIQUID EXTRACTION. Milton W. Davis, Jr., Thomas E. Hicks, and Theodore Vermeulen. May 1953. Decl. Aug. 18, 1953. 41p. (AECD-3545; UCRL-1013(rev.))

AECD-3546 5840
Radiation Lab., Univ. of Calif., Berkeley
NEUTRON TOTAL CROSS SECTION FOR BISMUTH AND URANIUM BETWEEN 45 AND 160 MEV. W. I. Linlor and B. Ragent. Aug. 5, 1953. Decl. Aug. 24, 1953. 5p. (AECD-3546; UCRL-2294)

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Argonne National Lab.
DETERMINATION OF OXYGEN-URANIUM RATIOS IN URANIUM COMPOUNDS. Henry R. Hoekstra and Joseph J. Katz. June 1953. Decl. Aug. 11, 1953. 8p. (AECD-3549; ANL-WMM-1121)

AECD-3550 5854
Oak Ridge National Lab.
THE ECONOMICS OF POWER REACTOR PROCESSING. D. E. Ferguson. [July 1953] 14p. (AECD-3550; CF-53-7-46)

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Phillips Petroleum Co., Atomic Energy Div.
THE MATERIALS TESTING REACTOR. L. J. Weber. Sept. 24, 1952. Decl. with deletions Aug. 24, 1953. 14p. (AECD-3552; IDO-16032)

AECD-3553 5724
Battelle Memorial Inst.
THE VAPOR PRESSURE OF BERYLLIUM FLUORIDE. K. A. Sense, M. J. Snyder, and J. W. Clegg. [1950] Decl. Aug. 24, 1953. 9p. (AECD-3553; BMI-HWR-55)

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Ionics, Inc.
A STUDY OF THE SEPARATION OF H AND D DURING ENDOSMOTIC SOLVENT TRANSFER ACROSS CATION-EXCHANGE MEMBRANES. J. A. Marinsky and W. E. Katz. Mar. 10, 1953. Decl. May 5, 1953. 44p. (AECD-3556; NYO-3922)

AECD-3557 5856
Oak Ridge National Lab.
A LOW COST EXPERIMENTAL NEUTRON CHAIN REACTOR. PART 2. Fred H. Abernathy, Lawrence G. Barrett, William A. Berger, John A. Dever, John F. Maurer, Russell B. Mesler, and Paul J. Sykes, Jr. Aug. 20, 1952. Decl. with deletions Aug. 6, 1953. 254p. (AECD-3557; CF-52-11-125)

USAEC UNCLASSIFIED REPORTS

AECU-2040(suppl. 2) 5841
Neutron Cross Section Advisory Group, AEC
NEUTRON CROSS SECTION COMPILATION; SUPPLEMENT 2. Brookhaven Neutron Cross Section Compilation Group. June 15, 1953. 54p. (AECU-2040(suppl. 2))

AECU-2622 5682
Biological Research Lab., Southern Ill. Univ.
THE EFFECTS OF ULTRAVIOLET AND X-RADIATIONS UPON THE HETEROCHROMATIN OF SACCHAROMYCES. G. Fred Townsend, Alvin Sarachek, and Carl C. Lindegren. [1953] 7p. (AECU-2622)

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Institute of Engineering Research, Univ. of Calif., Berkeley
HEAT TRANSFER TO MERCURY IN TURBULENT PIPE FLOW. H. A. Johnson, W. J. Clabaugh, and J. P. Hartnett. July 1953. 63p. (AECU-2627)

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Bureau of Entomology and Plant Quarantine, Dept. of Agriculture
TRANSFER OF RADIOACTIVITY FROM WORKER TO DRONE HONEY BEES AFTER INGESTION OF RADIOACTIVE SUCROSE. E. Oertle, Bureau of Entomology and Plant Quarantine, Dept. of Agriculture and Robert B. Emerson and H. E. Wheeler, Louisiana State Univ. [1953] 7p. (AECU-2630)

AECU-2636 5705
Forrestal Research Center, Princeton Univ.
A PRELIMINARY STUDY OF THE FORMATION OF SOLID PHASES IN MIXTURES OF HYDROGEN AND TITANIUM TETRACHLORIDE VAPOR FLOWING THROUGH AN ELECTRIC GLOW DISCHARGE. FINAL REPORT FOR THE PERIOD MARCH 15, 1952 TO MARCH 15, 1953. G. C. Akerlof. Apr. 1953. 69p. (AECU-2636)

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Norman Bridge Lab. of Physics, Calif. Inst. of Tech.
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AECU-2640 5792
David Sarnoff Research Center
ELECTRONIC DEVICES FOR NUCLEAR PHYSICS;

QUARTERLY REPORT [FOR] JANUARY 1953–APRIL 1953. G. A. Morton, P. W. Davison, M. W. Green, M. H. Greenblatt, and A. H. Sommer. June 23, 1953. 25p. (AECU-2640; Quarterly Report 11)

AECU-2641 5731
Wisconsin Univ.
THE INFLUENCE OF STRUCTURE, PHASE AND ADDED CHLORINE ON THE ORGANIC YIELDS OF THE $Cl^{37}(n,\gamma)Cl^{38}$ REACTION IN ALKYL CHLORIDES. J. C. W. Chien and J. E. Willard. [1953] 19p. (AECU-2641)

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Kansas Univ.
EFFECT OF RADIOACTIVE PHOSPHORUS (P^{32}) ON THE FORMED ELEMENTS IN THE BLOOD AND UPON OTHER TISSUES OF THE COTTON RAT SIGMODON HISPIDUS TEXIANUS (AUDUBON AND BACHMAN). Robert M. Hankins, A. Byron Leonard, and Charles A. Leone. [1953] 49p. (AECU-2642)

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Pennsylvania Univ. School of Medicine
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Boyce Thompson Inst. for Plant Research, Inc.
RATE OF UPTAKE AND TOXIC DOSE ON A SPORE WEIGHT BASIS OF VARIOUS FUNGICIDES. Lawrence P. Miller, S. E. A. McCallan, and Richard M. Weed. [1953] 37p. (AECU-2653)

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THE CHEMISTRY AND BIOSYNTHESIS OF ISOTOPICALLY LABELED CELLULOSE. PROGRESS REPORT, APRIL 10, 1953. 12p. (AECU-2654)

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Biophysical Lab., Harvard Medical School
THE SEPARATION OF SODIUM FROM POTASSIUM BY MEANS OF ION-EXCHANGE CHROMATOGRAPHY. Walter L. Arons and A. K. Solomon. Biophysical Lab., Harvard Medical School and Peter Bent Brigham Hospital, Boston. [1952] 16p. (AECU-2661)

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THE ELECTRON-POSITRON SPECTRUM OF Zn^{65} ABOVE 5 KEV. J. F. Perkins and S. K. Haynes. July 24, 1953. 31p. (AECU-2670)

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ATTACK ON METALS BY LITHIUM. Walter D. Wilkinson and Frank L. Yaggee. Oct. 13, 1950. 37p. (ANL-4990)

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KINETICS OF THE EXCHANGE OF NICKEL-ETHYLENE-DIAMINETETRAACETATE ION WITH NICKELOUS ION. Charles M. Cook, Jr. and F. A. Long. Brookhaven National Lab. and Cornell Univ. [Submitted Aug. 26, 1953] 22p. (BNL-1547)

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TECHNICAL DISCUSSION OF BROOKHAVEN OFF-SITE PERSONNEL MONITORING SERVICE. F. P. Cowan. July 31, 1953. 9p. (BNL-1548)

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A HYPOTHESIS CONCERNING THE RELATIONS AMONG THE "NEW UNSTABLE PARTICLES." M. Goldhaber. Aug. 13, 1953. 9p. (BNL-1551)

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Brookhaven National Lab.
INTERACTIONS OF 500-MEV NEGATIVE π^- MESONS WITH EMULSION NUCLEI. M. Blau, M. Caulton, and J. E. Smith. [1952] 8p. (BNL-1553)

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Brookhaven National Lab.
MIXED CONFIGURATIONS IN NUCLEI. A. De-Shalit, Laboratory for Nuclear Science, Mass. Inst. of Tech. and M. Goldhaber, Brookhaven National Lab. [Aug. 11, 1953] 25p. (BNL-1554)

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Brookhaven National Lab.
PHARMACOLOGICAL STUDIES OF RADIOGERMANIUM (Ge^{71}). [PART] 2. H. C. Dudley, Radioisotope Lab., Naval Hospital, St. Albans, New York, and Brookhaven National Lab. [nd] 8p. (BNL-1555)

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MESON PRODUCTION BY 500-MEV NEGATIVE PIONS. M. Blau, M. Caulton, and J. E. Smith. [1952] 9p. (BNL-1558)

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THE DIRECTIONAL CORRELATION AND ELECTRIC QUADRUPOLE INTERACTION IN THE γ-γ CASCADE OF 48.7 MIN Cd^{111m}. J. J. Kraushaar and R. V. Pound. [Aug. 26, 1953] 7p. (BNL-1559)

BNL-1561 5845
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THE NUCLEAR MAGNETIC MOMENT OF S^{35} BY MICROWAVE SPECTROSCOPY. Bernard F. Burke and M. W. P. Strandberg, Massachusetts Inst. of Tech. and Victor W. Cohen, Brookhaven National Lab. and Walter S. Koski, Johns Hopkins Univ. [1952] 8p. (BNL-1561)

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DESOXYPENTOSE NUCLEIC ACID SYNTHESIS DURING MICROSPOROGENESIS IN TRADESCANTIA. M. J. Moses and J. H. Taylor. Brookhaven National Lab. and Columbia Univ. [nd] 1p. (BNL-1564)

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A COMPARISON OF X-RAY INDUCED DOMINANT AND RECESSIVE LETHALS IN FIRST MEIOTIC METAPHASE EGGS AND IN SPERM OF HABROBRACON. Gertrude Heidenthal. [nd] 1p. (BNL-1565)

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Daniel E. Koshland, Jr. and Sylvia S. Stein. [nd] 26p. (BNL-1566)

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THE TOTAL π^--p CROSS SECTION AT 840 AND 470 MEV. A. M. Shapiro, C. P. Leavitt, and F. F. Chen. [nd] 6p. (BNL-1567)

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π^+-p SCATTERING NEAR 260 MEV. W. B. Fowler, R. M. Lea, W. D. Shephard, R. P. Shutt, A. M. Thorndike, and W. L. Whittemore. [1953] 5p. (BNL-1569)

CF-53-3-176 5750
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MINIMUM WEIGHT ANALYSIS FOR AN AIR RADIATOR – LAMINAR FLOW. W. S. Farmer. July 10, 1953. 37p. (CF-53-3-176)

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THE (n,γ) CROSS SECTION FOR Na^{23} AT 500-600 KEV. F. H. Abernathy, Oak Ridge National Lab. and H. Reese, Jr., Curtiss-Wright Corp. Aug. 4, 1953. 2p. (CF-53-8-22)

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SPECTROPHOTOMETRIC DETERMINATION OF IRON IN VANADIUM, CHROMIUM, MANGANESE, NICKEL AND ZINC: 1,10-PHENANTHROLINE RATE PHENOMENA. D. W. Margerum and Charles V. Banks. July 23, 1953. 16p. (ISC-366)

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POLAR VERSUS NON-POLAR ICE. R. E. Rundle. [Aug. 31, 1953] 3p. (ISC-399)

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Carbide and Carbon Chemicals Co. (K-25)
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AREA ANALYSIS FOR SELF-INDICATION DATA. J. P. Simpelaar. Aug. 17, 1953. 19p. (KAPL-957)

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DISSOLVING SODIUM-POTASSIUM ALLOYS. L. P. Pepkowitz. Aug. 12, 1953. 7p. (KAPL-976)

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THE 1.25 MINUTE Rb^{83m} DAUGHTER OF 27 DAY Sr^{83}. L. M. Litz, S. A. Ring, and W. R. Balkwell. Issued Aug. 1953. 13p. (MTA-46)

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DISTRIBUTION OF STRONTIUM WITHIN BARIUM SULFATE PRECIPITATED FROM HOMOGENEOUS SOLUTION. Louis Gordon, Carl C. Reimer, and Benjamin P. Burtt. Aug. 19, 1953. 28p. (NYO-3193)

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COLLOIDAL CHARACTERISTICS AND BEHAVIOR OF SOME FLORIDA PHOSPHATE SLIMES. PROGRESS REPORT OF WORK FROM DECEMBER 1, 1952–JUNE 30, 1953. Victor K. La Mer, Robert H. Smellie, Jr., and Pui-Kum Lee. Issued July 30, 1953. 37p. (NYO-3288)

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Massachusetts Inst. of Tech.
MICROBIOLOGICAL INVESTIGATIONS OF THE LETHAL EFFECTS OF VARIOUS TYPES OF IONIZING RADIATIONS; PROGRESS REPORT FOR THE PERIOD SEPTEMBER 1, 1952 TO JUNE 30, 1953. Bernard E. Proctor and Samuel A. Goldblith. June 30, 1953. 90p. (NYO-3340; Technical Report 4)

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Rutgers Univ. School of Chemistry
BEHAVIOR OF THE CONDENSED PHOSPHATES IN ANION-EXCHANGE CHROMATOGRAPHY. [PROGRESS REPORT FOR] FEBRUARY 1, 1952 TO JULY 1, 1953. John Beukenkamp, William Rieman, III, and Siegfried Lindenbaum. Issued Aug. 24, 1953. 40p. (NYO-3440)

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Rochester Univ.
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Rochester Univ.
DOUBLE SCATTERING OF HIGH ENERGY PROTONS. C. L. Oxley, W. F. Cartwright, and J. Rouvina. Aug. 18, 1953. 38p. (NYO-3830)

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Atomic Energy Project, Western Reserve Univ.
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Little, Arthur D., Inc.
DEVELOPMENT OF A HIGH TEMPERATURE–HIGH EFFICIENCY AIR FILTER: SUMMARY REPORT. Issued Aug. 18, 1953. 48p. (NYO-4527)

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Palmer Physical Lab., Princeton Univ.
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A GENERAL THEORY OF STOCHASTIC ESTIMATES OF THE NEUMANN SERIES FOR THE SOLUTIONS OF CERTAIN FREDHOLM INTEGRAL EQUATIONS AND RELATED SERIES; MATHEMATICS PANEL. G. E. Albert. Issued Aug. 28, 1953. 48p. (ORNL-1508)

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Oak Ridge National Lab.
TRACK WIDTH OF A HEAVY CHARGED PARTICLE. Jacob Neufeld and Walter S. Snyder. Issued Aug. 28, 1953. 18p. (ORNL-1594)

ORO-100 5752
Tennessee Univ.
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Grand Junction Operations Office, AEC
AIRBORNE RADIOMETRIC SURVEY OF THE WILLAHA COCONINO COUNTY, ARIZONA AREA. M. L. Nielsen. July 15, 1953. 8p. (RME-31)

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Division of Raw Materials, AEC
PRELIMINARY RECONNAISSANCE OF THE DRIPPING SPRING QUARTZITE FORMATION IN GILA AND PINAL COUNTIES, ARIZONA. W. E. Mead and R. L. Wells. June 1953. 14p., 1 illus. (RME-2003)

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FINAL TECHNICAL REPORT [FOR MAY 1, 1951–JUNE 30, 1953]. PART 1. STUDIES OF THE MINOR CONSTITUENTS IN SOME CALIFORNIA BEACH SANDS. PART 2. OPTICAL AND CHEMICAL STUDIES OF MINERALS CONTAINING TANTALUM, NIOBIUM, TITANIUM AND URANIUM AS A PRELIMINARY TO INVESTIGATION OF THE MINERALOGY OF SOME IDAHO PLACER DEPOSITS. C. Osborne Hutton. Issued June 30, 1953. 55p. (RME-3049)

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Radiation Lab., Univ. of Calif., Berkeley
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APPLICATION AND OPERATION OF THE UCRL DIFFERENTIAL ANALYZER. John Killeen. June 8, 1953. 36p. (UCRL-2239)

UCRL-2241 5783
Radiation Lab., Univ. of Calif., Berkeley
PHYSICS DIVISION QUARTERLY REPORT, FEBRUARY, MARCH, AND APRIL, 1953. June 10, 1953. 41p. (UCRL-2241)

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A SEARCH FOR B^{13}. Edward L. Hubbard, Lawrence Ruby, and Warren F. Stubbins. Aug. 21, 1953. 4p. (UCRL-2306)

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OTHER UNCLASSIFIED REPORTS OF SPECIAL INTEREST TO AEC LABORATORIES

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SOME COLD CATHODE VALVE CIRCUITS USED IN THE MEASUREMENT OF RADIOACTIVITY. D. H. Peirson. Mar. 1953. 10p. (AERE-EL/R-1204)

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Atomic Energy Research Establishment, Harwell, Berks (England)
THE USE OF Tl^{204} IN RADIOACTIVE STATIC ELIMINATORS. J. F. Cameron. June 30, 1953. 18p. (AERE-I/R-1216)

AERE-Inf/Bib-90 5813
Atomic Energy Research Establishment, Harwell, Berks (England)
CHERENKOV RADIATION: A BIBLIOGRAPHY, INCLUDING CHERENKOV DETECTORS AND COUNTERS. J. E. Terry. 1953. 12p. (AERE-Inf/Bib-90)

AMRL-112 5688
Army Medical Research Lab., Fort Knox
X-IRRADIATION SENSITIVITY OF ESCHERICHIA COLI B IN RELATION TO TERMINAL RESPIRATION AND OXIDATIVE ASSIMILATION. Charles R. Goucher, Eugene E. Woodside, and Walter F. Kocholaty. Mar. 10, 1953. 10p. (AMRL-112)

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FURTHER INVESTIGATIONS INTO THE MODIFICATION OF RADIATION SENSITIVITY AFFORDED BY COBALT. W. H. Parr, T. O'Neill, S. G. Bush, and A. T. Krebs. Apr. 10, 1953. 12p. (AMRL-114)

BM-RI-4958 5706*
Bureau of Mines, Explosives and Physical Sciences Div.
THE THERMODYNAMICS OF COMBUSTION GASES: TEM-

PERATURES AND COMPOSITION OF THE COMBUSTION PRODUCTS OF OXYACETYLENE FLAMES. Helen E. Edwards, Robert W. Smith, Jr., and Stuart R. Brinkley, Jr. March 1953. 10p. (BM-RI-4958; AD-7432)

CEI-52 5739
Chalk River Project (Canada)
LIQUID-LIQUID EXTRACTION UNDER CONDITIONS OF CONCENTRATION EQUILIBRIUM. S. D. Cavers. Sept. 15, 1952. 100p. (CEI-52)

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Geological Survey
BIBLIOGRAPHY OF U.S. GEOLOGICAL SURVEY TRACE ELEMENTS AND RELATED REPORTS. Diane Curtis and Shirley S. Houser. [1953] 23p. (GS-C-281)

JPL-Memo-20-71 5726
Jet Propulsion Lab., Calif. Inst. of Tech.
MEASUREMENT OF HEAT OF DISSOCIATION OF FLUORINE BY EFFUSION METHOD. Henry Wise. May 15, 1952. 13p. (JPL-Memo-20-71; AD-1918)

JPL-PR-24-4 5805
Jet Propulsion Lab., Calif. Inst. of Tech.
AN IMPROVED RADIO-FREQUENCY MASS SPECTROMETER AND A NEW METHOD FOR INTERPRETING DATA. Bertram Keilin. Nov. 25, 1952. 19p. (JPL-PR-24-4; AD-686)

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Langley Aeronautical Lab., NACA
STUDIES OF THE USE OF FREON-12 AS A WIND-TUNNEL TESTING MEDIUM. Albert E. von Doenhoff, Albert L. Braslow, and Milton A. Schwartzberg. Aug. 1953. 58p. (NACA-TN-3000)

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Office of Basic Instrumentation, National Bureau of Standards
PHOTOELECTRIC COUNTER FOR AN INTERFEROMETRIC CALIBRATION DEVICE. H. R. Smith and D. R. Tate. June 1953. 11p. (NBS-2536)

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RADIOLOGICAL INSTRUMENT CALIBRATION; QUARTERLY PROGRESS REPORT FOR THE QUARTER ENDING MARCH 31, 1953. Frank H. Day. [nd] 64p. (NBS-2594)

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PROJECTS AND PUBLICATIONS OF THE NATIONAL APPLIED MATHEMATICS LABORATORIES: A QUARTERLY REPORT FOR APRIL THROUGH JUNE 1953. 89p. (NBS-2688)

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SURVEY OF ANALOG-TO-DIGITAL CONVERTERS. C. W. Bower. July 1953. 30p. (NBS-2755)

NP-4668 5799
Electrical Engineering Research Lab., Univ. of Texas
FINAL ENGINEERING REPORT ON THE TYPE I AIRBORNE MICROWAVE REFRACTOMETER. C. M. Crain. Dec. 15, 1952. 44p. (NP-4668; AD-5559)

NP-4720 5710
Washington Univ.
HEATS OF FORMATION OF CHROMIUM(II) AND CHROMIUM(III) IODIDES [FOR PERIOD] JANUARY 1953–JULY 1953. N. W. Gregory and T. R. Burton. Aug. 15, 1953. 5p. (NP-4720; Technical Report 1)

NP-4729 5770
Cryogenic Lab., Ohio State Univ.
THE HEAT CAPACITY OF TITANIUM FROM 15° TO 305°K. Charles W. Kothen and Herrick L. Johnston. Feb. 24, 1953. 13p. (NP-4729; AD-3199; TR-280-8)

NP-4735 5756
New York State Coll. of Ceramics, Alfred Univ.
STUDY OF BASIC MECHANISM OF DIFFUSION OF METALS INTO CERAMIC MATERIALS. PROGRESS REPORT FOR THE PERIOD APRIL 10, 1953–JULY 10, 1953. Robert C. Turnbull and W. G. Lawrence. [nd] 7p. (NP-4735)

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Cryogenic Lab., Ohio State Univ.
THERMAL EXPANSION OF ZIRCONIUM BETWEEN 290° AND 1600° K. Gordon B. Skinner and Herrick L. Johnston. Mar. 16, 1953. 9p. (NP-4737; TR-280-9)

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Armour Research Foundation
DEVELOPMENT OF TRANSFORMATION DATA FOR SPECIAL TITANIUM ALLOYS; CONTRACTOR'S LETTER REPORT FOR THE PERIOD JULY 1, 1953 TO JULY 31, 1953. D. J. DeLazaro and D. J. McPherson. 3p. (NP-4762; Contractor's Letter Report 1)

NP-4764 5869
Case Inst. of Tech.
ENERGY LOSS AND SCATTERING OF .624 MEV ELECTRONS IN METALLIC FOILS. Arthur Lindener. [1952] 23p. (NP-4764; Technical Report 20)

NP-4766 5773
Institute of Engineering Research, Univ. of Calif., Berkeley
THE CORRELATION OF HIGH TEMPERATURE RUPTURE DATA FOR NIOBIUM. Raymond L. Orr and Douglas W. Bainbridge. July 1, 1953. 11p. (NP-4766; Technical Report 28)

TEI-328A 5764
Geological Survey
GEOLOGIC ASPECTS OF THE RESOURCE APPRAISAL OF URANIUM DEPOSITS IN PRE-MORRISON FORMATIONS OF THE COLORADO PLATEAU: AN INTERIM REPORT. W. I. Finch. May 1953. 35p. (TEI-328A)

TEI-337 5765
Geological Survey
RECONNAISSANCE FOR URANIUM-BEARING CARBONACEOUS ROCKS IN CALIFORNIA AND ADJACENT PARTS OF OREGON AND NEVADA. George W. Moore and James G. Stephens. June 1953. 19p. (TEI-337)

TEM-676 5766
Geological Survey
DISTRIBUTION OF COARSE- AND FINE-GRAINED ROCKS IN THE WASATCH FORMATION AND THEIR RELATIONSHIP TO URANIUM DEPOSITS, POWDER RIVER BASIN, WYOMING. David F. Davidson. May 1953. 12p. (TEM-676)

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Geological Survey
RECONNAISSANCE FOR URANIUM IN THE POWDER RIVER BASIN, WYOMING. David F. Davidson. May 1953. 32p., 1 illus. (TEM-677)

USNRDL-396 5680
Naval Radiological Defense Lab.
BLISTER FORMATION AND TISSUE TEMPERATURE IN RADIANT ENERGY AND CONTACT BURNS. P. R. Kuhl, G. E. Sheline, and E. L. Alpen. May 12, 1953. 36p. (USNRDL-396; AFSWP-236)

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Naval Radiological Defense Lab.
THE COMBINED EFFECTS OF THERMAL BURNS AND WHOLE-BODY X IRRADIATION ON SURVIVAL TIME AND MORTALITY. E. L. Alpen and G. E. Sheline. May 18, 1953. 18p. (USNRDL-402; AFSWP-470)

WADC-TR-52-101(pt.1) 5754
Institute of Engineering Research, Univ. of Calif., Berkeley
EQUIPMENT FOR TESTING THE CREEP PROPERTIES OF METALS UNDER INTERMITTENT STRESSING AND HEATING CONDITIONS. Lawrence A. Shepard and John E. Dorn. July 1952. 31p. (WADC-TR-52-101(pt.1); ATI-167643)

WADC-TR-52-191(pt.1) 5728
Purdue Research Foundation
FLUORINE CONTAINING ELASTOMERS. O. R. Pierce and E. T. McBee. Oct. 1952. 70p. (WADC-TR-52-191(pt.1); AD-1121)

WADC-TR-53-11 5755
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LOW-TEMPERATURE LUBRICATING ENGINE OIL ADDITIVES. Gilbert Gavlin, Edwin A. Swire, and Sam P. Jones, Jr. Apr. 1953. 365p. (WADC-TR-53-11)

NUCLEAR SCIENCE ABSTRACTS

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BIOLOGY AND MEDICINE

5676
Pennsylvania Univ. School of Medicine
COMPARATIVE CYTOLOGY OF WILD TYPE SACCHAROMYCES AND A RESPIRATIONALLY-DEFICIENT MUTANT. Philip E. Hartman and Charlotte Liu. [1953] 21p. (AECU-2643)

Observations and comparisons of wild-type Saccharomyces and a stable respirationally deficient mutant were made with phase and light microscopy on unstained and supravitally stained living cells and on fixed and stained preparations. Observations are described. (auth)

5677
Biological Lab., Cold Spring Harbor
ON COADAPTATION IN DROSOPHILA. Bruce Wallace. [1953] 23p. (AECU-2660)

The influence of coadaptation on the mode of operation of natural selection in populations of Drosophila is discussed. The hypothesis is suggested that there may be a selection based on chromosomal mechanisms facilitating coadaptation. Data from a number of genetic studies of Drosophila are reviewed, and factors which influence selection are discussed. (C.H.)

5678
Brookhaven National Lab.
MENINGOENCEPHALITIS IN PIGEONS. E. Dougherty, III, Duck Disease Research Lab., N. Y. State Veterinary Coll. and L. Z. Saunders, Brookhaven National Lab. [nd] 12p. (BNL-1475)

A syndrome characterized by torticollis, ataxia, and eventual prostration was observed as an enzootic of 3 months duration in a large pigeon flock. The condition was self-limiting, and less than 1% of the flock was affected. Non-suppurative, demyelinating meningoencephalitis was present in the brains of affected birds. The lesions were suggestive of a viral etiology, but no infectious agent could be isolated or demonstrated histologically and the etiology remained undetermined. A brief comparison of the condition is made with other nervous diseases of pigeons. (auth)

5679
Brookhaven National Lab.
PROGRESSIVE RETINAL ATROPHY IN DOGS. L. Z. Saunders and R. F. Smith. [1952] 10p. (BNL-1530)

A progressive retinal atrophy which is believed to be hereditary occurs in Labrador Retrievers. The clinical symptoms consist of a constant mydrasis and an alteration in the color of the pupil from black to bright green. These symptoms are described and illustrated by means of Kodachrome photographs which compare the appearance of affected and normal eyes. (auth)

5680
Naval Radiological Defense Lab.
BLISTER FORMATION AND TISSUE TEMPERATURE IN RADIANT ENERGY AND CONTACT BURNS. P. R. Kuhl, G. E. Sheline, and E. L. Alpen. May 12, 1953. 36p. (USNRDL-396; AFSWP-236)

A comparative study of skin burns as produced by contact with hot H_2O or by high-intensity radiant thermal energy has been made. Blister formation and subcutaneous-tissue temperature of the rat's ear are used as the bases for comparison. The results indicate that, other conditions remaining constant, blister formation occurs within a relatively narrow range of applied energy, and is a useful criterion for comparison of effectiveness of various sources of thermal energy. Exposure times from 0.1 to 8.0 sec for radiant burns and 0.25 to 300 sec for contact burns were studied. For these contact and radiant burns, the pathological changes in the skin are similar. For equal exposures of less than 1.0 sec and equal surface injury, the contact burn is probably associated with a more rapid decrease of injury severity with depth than is the radiant burn. The median effective H_2O temperature and the median effective radiant energy for vesication were determined. It was found that at shorter exposure times, a higher H_2O temperature or a greater rate of radiant energy delivery is required to produce a similar effect. For both burn types, it appears that less total energy is required for the shorter exposure times. Evidence is presented which suggests that, under the described conditions, production of a blister in rat's ear skin involves a time-tissue temperature episode similar to that required for vesication of human skin. (auth)

5681
ON THE RATE OF THE REGENERATION OF PROTEINS OF DIFFERENT ORGANS AND TISSUES. V. N. Orekhovich, A. S. Konikova, K. D. Orekhovich, and N. M. Dobbert. Translated from Doklady Akad. Nauk S.S.S.R. 71, 105-7(1950). 4p. (AEC-tr-1598; AERE-11/3/5/331)

A D tracer was used to study the rate of regeneration of the total protein of organs and tissues and of different protein fractions of individual organs. Proteins of the liver regenerate most rapidly, and proteins of skin and muscles regenerate considerably slower. The remaining organs occupy an intermediate position. The rate of removal of D from proteins of organs and tissues was found to be different from its rate of entry. For example, the kidneys are fifth as regards the rate of entry of D but second as regards the rate of removal. The same discrepancies were observed in the proteins of lungs and stomach. Further investigation showed that the rate of regeneration of the globulins of blood, liver, and skin is practically the same, whereas the rate of regeneration of skin collagen is considerably lower than that of the skin globulins. Thus, the rate of regeneration of proteins in any given organ differs from the various protein fractions. Adult normal rats and newborn rats and their mother were used in investigating the regeneration of proteins of various organs. It was found that the rate of regeneration of skin and muscle proteins of the mother is considerably lower than that of normal adult rats. The regeneration of the protein of the internal organs of the mother rat is unchanged. The proteins of all tissues of newborn rats have almost the same value for excess D, being considerably higher than that of the proteins of any tissues of the mother. (J.A.G.)

RADIATION EFFECTS

5682
Biological Research Lab., Southern Ill. Univ.
THE EFFECTS OF ULTRAVIOLET AND X-RADIATIONS

UPON THE HETEROCHROMATIN OF SACCHAROMYCES. G. Fred Townsend, Alvin Sarachek, and Carl C. Lindegren. [1953] 7p. (AECU-2622)

Samples of a tetraploid culture of known resistance to ultraviolet and x radiation were used in a study of the differential effects of the two radiations on the heterochromatin of Saccharomyces. In interphase cells which were irradiated with lethal doses of x rays, crescent formation occurred normally; in similar cells exposed to sublethal doses of ultraviolet irradiation, crescent formation was delayed from 2 to 3 hr. The effect of ultraviolet was only temporary; all cells eventually formed crescents. When an attempt was made to reverse the ultraviolet action by light, a marked increase in cell survivals resulted, but no reduction of the inhibition of crescent formation was detected. (J.A.G.)

5683

Kansas Univ.

EFFECT OF RADIOACTIVE PHOSPHORUS (P^{32}) ON THE FORMED ELEMENTS IN THE BLOOD AND UPON OTHER TISSUES OF THE COTTON RAT SIGMODON HISPIDUS TEXIANUS (AUDUBON AND BACHMAN). Robert M. Hankins, A. Byron Leonard, and Charles A. Leone. [1953] 49p. (AECU-2642)

Four groups of cotton rats, weighing 72 to 75 g, were injected intraperitoneally with different amounts of P^{32}. Blood was taken by cardiac puncture from the animals under conditions of primary ether anesthesia. The characteristics of the blood observed in this investigation were erythrocyte volume, sedimentation rate, hemoglobin, total erythrocytes, total leucocytes, and differential leucocyte counts. In animals injected with 1.1 μc/g of body wt., the total leucocyte count dropped appreciably, but the other characteristics remained normal. In animals injected with 4.0 μc/g of body wt., the total leucocyte and total erythrocyte counts fell rapidly, but the counts rose after the fourteenth day. The sedimentation rate, erythrocyte volume, and hemoglobin fell slowly until the fourteenth day when recovery began. Both the total red cell count and total white cell count fell considerably in the animals injected with 5.0 μc/g of body wt. The erythrocyte volume and hemoglobin fell about 50% during the first 14 days. The sedimentation rate rose rapidly and did not show any initial fall. Death of 80% of the animals had occurred by the fourteenth day. In the animals injected with 4.3 μc/g of body wt., the estimated LD50/30 days dosage, the total white cell count, total red cell count, erythrocyte volume, sedimentation rate, and hemoglobin all fell and were at their lowest on the fourteenth day after injection. In all groups the percent of lymphocytes abruptly increased above normal and then returned toward normal. In contrast, the percent of neutrophils decreased abruptly and then slowly returned toward normal. A description of the details of animal care, breeding habits, and colony maintenance of the cotton rat is also given. (J.S.R.)

5684

Illinois Univ. Coll. of Medicine

THE LETHAL EFFECT OF INTRAGASTRIC IRRADIATION IN THE DOG. Armand Littman, Benum W. Fox, Harold M. Schoolman, and A. C. Ivy. [nd] 15p. (AECU-2644)

Lethal doses of intragastric radiation from Ra, Sr^{90}, or Ru^{106}-Rh^{106} caused dehydration, weight loss, hemoconcentration, leukocytosis with eosinopenia and lymphopenia, and death within two months, when administered to fistula dogs. Irradiation of the isolated stomach of dogs caused death within 3 days to one month. Gastrectomy performed after lethal radiation exposures to dogs appeared to prevent death, indicating that damage to the stomach itself is at least partly responsible for death due to intragastric irradiation under the experimental conditions employed. (C.H.)

5685

Chicago Univ.

STUDIES ON THE PATHOGENESIS OF POST-IRRADIATION INFECTION. C. Phillip Miller. [nd] 15p. (AECU-2646)

Data are presented on the incidence of generalized infection in mice exposed to 450 or 600 r of total-body x radiation. Cultures of blood or spleen from mice exposed to doses of 600 r showed a high incidence of bacteremia during the second week post-irradiation, which coincided with the period of greatest mortality. Data are included on the onset and duration of bacteremia caused by various organisms and the effect of subcutaneously adminstered streptomycin on mortality of the mice. (C.H.)

5686

Stanford Univ.

THE EFFECTS OF STARVATION ON PHOTOREACTIVATION IN COLPIDIUM COLPODA. A. C. Giese, C. L. Brandt, C. Jacobson, D. C. Shepard, and R. T. Sanders. [1953] 22p. (AECU-2659)

Specimens of Colpidium colpoda starved in balanced salt medium before treatment with ultraviolet light were found to be more sensitive to ultraviolet light than were well-fed controls. Illumination with blue light of starved Colpidia previously treated with UV resulted in photoreactivation, and protection of the starved Colpidia from UV light was afforded by pretreatment with blue light. Immersing Colpidia in glutathione solutions during irradiation with UV also offered some protection. Some of the theoretical implications of the results are discussed. (C.H.)

5687

Illinois Univ. Coll. of Medicine

EFFECT OF INTRAGASTRIC IRRADIATION ON GASTRIC ACIDITY IN THE DOG. Benum W. Fox, Armand Littman, M. I. Grossman, and A. C. Ivy. Feb. 12, 1953. 19p. (AECU-2675)

Radioapplicators for intragastric irradiation were prepared from solid materials which, unlike liquid materials, may be kept under control at all times. Sources of radiation included Ra needles, Ru^{106}-Rh^{106}, and Sr^{90}. Design of the applicators and dose estimations are presented. Dogs were exposed to dosage ranges from ineffective to lethal. Results are tabulated for each radioactive source used. For each agent a dosage range was observed in which significant reduction of gastric acidity occurred, lasting from 2 to 6 months. Possible therapeutic applications in gastric ulcer are discussed. (C.H.)

5688

Army Medical Research Lab., Fort Knox

X-IRRADIATION SENSITIVITY OF ESCHERICHIA COLI B IN RELATION TO TERMINAL RESPIRATION AND OXIDATIVE ASSIMILATION. Charles R. Goucher, Eugene E. Woodside, and Walter F. Kocholaty. Mar. 10, 1953. 10p. (AMRL-112)

The oxidation of glucose, acetate, and succinate by variously adapted cells of Escherichia coli B before and during x irradiation did not alter the sensitivity of this organism to x irradiation. Stimulation of acetate and succinate oxidation by DNP did not lessen the sensitivity of succinate-grown organisms to x irradiation. Inhibition of succinate and acetate oxidation by DNP did not alter the sensitivity of acetate-grown organisms to x irradiation. Inhibition of oxidative assimilation either with an increased or lowered rate of oxidation did not appreciably modify the resistance of this organism to x irradiation. By means of adaptation techniques and with 2,4-dinitrophenol, cell suspensions of E. coli B were prepared, possessing a variety of oxidative and anabolic potentialities. However, regardless of vast differences in oxidative and assimilatory abilities, the sensitivity of these organisms to x irradiation was essentially unchanged. (auth)

5689
Brookhaven National Lab.
A COMPARISON OF X-RAY INDUCED DOMINANT AND RECESSIVE LETHALS IN FIRST MEIOTIC METAPHASE EGGS AND IN SPERM OF HABROBRACON. Gertrude Heidenthal. [nd] 1p. (BNL-1565)

Methods developed for estimating radiation-induced dominant and recessive lethals were applied to a study of genetic effects of x radiation on eggs and sperm of Habrobracon during first meiotic metaphase. The metaphase eggs were found to be more radiosensitive than the sperm. The effect of dose rate on induction of dominant and recessive lethal factors is discussed. (C.H.)

5690
Massachusetts Inst. of Tech.
MICROBIOLOGICAL INVESTIGATIONS OF THE LETHAL EFFECTS OF VARIOUS TYPES OF IONIZING RADIATIONS; PROGRESS REPORT FOR THE PERIOD SEPTEMBER 1, 1952 TO JUNE 30, 1953. Bernard E. Proctor and Samuel A. Goldblith. June 30, 1953. 90p. (NYO-3340; Technical Report 4)

The effects of the γ radiation from Co^{60} on various species of bacteria were determined and evaluated. An investigation of the sterilization efficiency of Co^{60} γ radiation compared with the sterilization efficiency of cathode rays and x rays available from a Van de Graaff accelerator has been conducted under various experimental conditions, with the use of chemical and physical dosimetric techniques. The experimental results have been treated statistically and the conclusions have been used as a basis for practical considerations relating to sterilization of materials by ionizing radiations. (For preceding period see NYO-3339) (auth)

5691
Naval Radiological Defense Lab.
THE COMBINED EFFECTS OF THERMAL BURNS AND WHOLE-BODY X IRRADIATION ON SURVIVAL TIME AND MORTALITY. E. L. Alpen and G. E. Sheline. May 18, 1953. 18p. (USNRDL-402; AFSWP-470)

The effects of combinations of thermal burns, produced by hot-water dipping, and whole-body x irradiation on the mortality and survival time of rats have been investigated. Animals subjected to burns without x irradiation die predominantly during the first 48-hr period following the trauma. This pattern is not influenced by the proportion of total body area which is burned. The median lethal burn area, LA_{50}, expressed as per cent total body area, has been determined for the initial 48-hr period. The addition of x irradiation decreases the LA_{50} for the initial 48-hr period. This effect is a function of irradiation dose; the larger the x-irradiation dose the smaller the 48-hr LA_{50}. The 48 hr LA_{50} for burn only is 33%; with the addition of 100 r, 30%; with 250 r, 27%; and with 500 r, 24%. X-irradiation dosages of 100 and 250 r, which in themselves cause no mortality, in combination with burns cause deaths during the interval 4 to 30 days in excess of the total number expected from burns alone. For example, 31 to 35% burns produce mortalities of 50, 65, and 100% with 0, 100, and 250 r, respectively. Sixteen to 20% burns, otherwise not lethal, produce 75% mortality when combined with 500 r. (auth)

RADIATION HAZARDS AND PROTECTION

5692
Army Medical Research Lab., Fort Knox
FURTHER INVESTIGATIONS INTO THE MODIFICATION OF RADIATION SENSITIVITY AFFORDED BY COBALT. W. H. Parr, T. O'Neill, S. G. Bush, and A. T. Krebs. Apr. 10, 1953. 12p. (AMRL-114)

The administration of a Co diet for 5 and 8 days before and for 15 days after x irradiation increased the tolerance of female Swiss-Webster albino mice to total body x irradiation (720 r). The administration of a Co diet for 36 days before and for 15 days after irradiation, and the administration of a Co diet for 30 days beginning immediately after irradiation produced no pronounced beneficial effects. The results indicate that the initial events produced by the administration of Co, rather than the events at later time intervals, are decisive for the observed increase in radioresistance. (auth)

5693
BIOLOGICAL EFFECTS OF IONIZING RADIATIONS and PROTECTION FROM DAMAGING EFFECTS OF IONIZING RADIATIONS, CHAPS. 21 and 22, p. 447-480. Translated from "Dozimetriya Ioniziruyushchikh Izlucheniy." K. K. Aglintsev. Moscow-Leningrad, Costeknizdat, 1950. 58p. (NP-2413)

5694
THE INTERVENTION OF OXYGEN IN RADIOBIOLOGY. J. Loiseleur. Ann. inst. Pasteur 84, 1001-9(1953) June. (In French)

For radiation to have its maximum effect, O must be present. Several examples are presented to support this belief. Radio-oxidation can be prevented by the presence of an O acceptor such as $COCl_2$, $NaNO_2$, or $FeSO_4$. The mechanism of the biological action of x rays is briefly discussed. It is concluded that organisms can be protected against external radiation by injecting them with O acceptors. (J.S.R.)

5695
OCCURRENCE OF NONEQUILIBRIUM ATMOSPHERIC MIXTURES OF RADON AND ITS DAUGHTERS. E. C. Tsivoglou, H. E. Ayer, and D. A. Holaday. Nucleonics 11, No. 9, 40-5(1953) Sept.

Analysis of Rn-daughter decay curves permits determination of the atmospheric concentrations of the daughters. With this data, the effectiveness of ventilation in protecting U-mine workers can be more accurately evaluated. (auth)

5696
STRAY RADIATION LEVELS IN THE VICINITY OF BETATRONS. Stanley H. Clark. Nucleonics 11, No. 9, 38-9 (1953) Sept.

Betatrons of 100, 50, and 15 Mev were surveyed to determine the γ-ray and neutron levels in the surrounding areas. Much of the radiation hazard arises from secondary targets, such as the accelerator "donut" or objects in the beam path. (auth)

5697
WALL TRANSFER UNIT AND TRANSFER CARRIER FOR HOT CELLS. C. W. Angel and F. Ring, Jr. Nucleonics 11, No. 9, 69(1953) Sept.

A unit is described which is designed to transfer solid radioactive specimens safely from a shipping carrier or a canal to the interior of a shielded hot cell. It consists of a double-tunneled steel casting permanently located in the 3-ft-thick concrete cell wall and a shielded, single-drawer transfer carrier. (auth)

TOXICOLOGY STUDIES

5698
Brookhaven National Lab.
PHARMACOLOGICAL STUDIES OF RADIOGERMANIUM (Ge^{71}). [PART] 2. H. C. Dudley, Radioisotope Lab., Naval Hospital, St. Albans, New York, and Brookhaven National Lab. [nd] 8p. (BNL-1555)

Studies of the rate of clearance of Ge and GeO_2 dusts from the lungs of rats indicate that these materials are rapidly eliminated through oxidation and/or simple solution. The findings strengthen the earlier conclusions that neither elemental Ge nor the oxide constitutes an acute industrial

hazard. Good housekeeping methods are mandatory, however, due to possible hydrides of Ge, As, and small amounts of Sb in Ge samples. (cf. NP-4048) (auth)

5699
Carbide and Carbon Chemicals Co. (Y-12)
BERYLLIUM TOXICOLOGY, A LITERATURE SEARCH. Frances L. Sachs and Kathryn D. Ballentine. July 17, 1953. 111p. (Y-975)

Abstracts of 249 selected titles on Be toxicology are presented. An author index and a subject index are included. (C.H.)

TRACER APPLICATIONS

5700
Bureau of Entomology and Plant Quarantine, Dept. of Agriculture
TRANSFER OF RADIOACTIVITY FROM WORKER TO DRONE HONEY BEES AFTER INGESTION OF RADIOACTIVE SUCROSE. E. Oertle, Bureau of Entomology and Plant Quarantine, Dept. of Agriculture and Robert B. Emerson and H. E. Wheeler, Louisiana State Univ. [1953] 7p. (AECU-2630)

In order to determine whether the workers would pass food to drone honey bees, the workers were offered sugar sirup containing C^{14}. Radioactivity counts of the drones showed that they had received relatively large quantities of radioactivity, probably radioactive sirup, through a dividing screen. This indicates that the drone honey bees are nutritionally dependent upon the workers. (auth)

5701
Cornell Univ. Medical Coll.
EFFECT OF ADRENOCORTICOTROPIC HORMONE, CORTISONE AND OTHER STEROID HORMONES ON PHOSPHOLIPID METABOLISM; FINAL REPORT. Clara Torda and Harold G. Wolff. Dec. 1952. 3p. (AECU-2649)

The effects of corticotropin(ACTH), cortisone, and certain other hormones on some aspects of the phospholipid metabolism of the brain were investigated. The P content of the phospholipid, nucleoprotein, and total acid-soluble P compound fractions, and the total P content of the brain were ascertained both colorimetrically and by specific activity studies after administration of P^{32}. A single injection of ACTH induced in the brain a temporary increase of the phospholipid content and the P^{32} uptake of phospholipids, indicating that ACTH increases phospholipid synthesis. Prolonged administration of several hormones did not result in significant changes in the content of the phospholipid, nucleoprotein, and total acid-soluble P compound fractions. Prolonged administration of TSH(thyrotropic factor) decreased the P fractions. Convulsions induced by chemical and electrical means resulted in a significant decrease of the specific activity of the phospholipid fraction indicating that brain phospholipids are utilized during activity of the brain. (auth)

5702
Boyce Thompson Inst. for Plant Research, Inc.
RATE OF UPTAKE AND TOXIC DOSE ON A SPORE WEIGHT BASIS OF VARIOUS FUNGICIDES. Lawrence P. Miller, S. E. A. McCallan, and Richard M. Weed. [1953] 37p. (AECU-2653)

Labeled 2-heptadecyl-2-imidazoline, Ag, Ce, and ferric dimethyldithiocarbamate were used to determine the uptake rate and toxic dose to fungi on a spore weight basis. A known weight of spores was suspended in 10 ml of an aqueous solution in a centrifuge tube. The mixture was centrifuged at various time intervals. The radioactivity was measured by the use of conventional scalers and end window type Geiger tubes with thin windows. With all the toxicants, the uptake was quite rapid, with most of the total quantity being taken up by the spores in the first 30 sec. The innate toxicity of the imidazoline was relatively low, but, because of the rapid uptake and marked accumulation from dilute solutions, control of germination capacity was readily attained. Ag was the most toxic on a spore weight basis. Spores of different species of fungi differed sharply in their reaction to Ce. Alternaria oleracea and Aspergillus niger took up Ce readily, but germination was unaffected. Less toxicant was taken up by Monilinia fructicola, but germination was retarded. (J.S.R.)

5703
Brookhaven National Lab.
DESOXYPENTOSE NUCLEIC ACID SYNTHESIS DURING MICROSPOROGENESIS IN TRADESCANTIA. M. J. Moses and J. H. Taylor. Brookhaven National Lab. and Columbia Univ. [nd] 1p. (BNL-1564)

The synthesis of desoxypentose nucleic acid during microsporogenesis was studied in Tradescantia by the simultaneous estimation of DNA content of single cells and the localization of P^{32} incorporation by autoradiography. In general a constant relationship was observed between the amount of DNA per cell and chromosome number. Three brief periods were observed when increasing DNA values occurred, and these were accompanied by P^{32} incorporation in the DNA fraction. The significance of the observations is discussed. (C.H.)

5704
Brookhaven National Lab.
CORRELATION OF BOND BREAKING WITH ENZYME SPECIFICITY CLEAVAGE POINT OF INVERTASE. Daniel E. Koshland, Jr. and Sylvia S. Stein. [nd] 26p. (BNL-1566)

A generalization concerning the point of cleavage of O bridge compounds in enzymatic reactions has been deduced by assuming that these reactions proceed by displacement mechanisms. It can be stated as follows: If the enzyme requirements for a substrate having an O bridge, i.e., R-O-Q, shows high specificity for R and low specificity for Q, then R-O cleavage occurs in the enzymatic reaction. To test this rule the point of splitting of sucrose in the invertase-catalyzed hydrolysis was determined by performing the hydrolysis in O^{18}-labeled water. Fructose-oxygen cleavage was observed in agreement with theory. Glucose-1-O^{18} was synthesized and a method of analysis for the O^{18} content of the C-1 hydroxyl group of glucose was developed. Other enzymatic reactions conforming to the generalization are mentioned to add evidence that the transglycosidases cause cleavage between the bridge O and the C of the group being transferred. (auth)

CHEMISTRY

5705
Forrestal Research Center, Princeton Univ.
A PRELIMINARY STUDY OF THE FORMATION OF SOLID PHASES IN MIXTURES OF HYDROGEN AND TITANIUM TETRACHLORIDE VAPOR FLOWING THROUGH AN ELECTRIC GLOW DISCHARGE. FINAL REPORT FOR THE PERIOD MARCH 15, 1952 TO MARCH 15, 1953. G. C. Akerlof. Apr. 1953. 69p. (AECU-2636)

A study of the net effect of the chemical reactions taking place when an electric discharge passes through a flowing mixture of H gas and $TiCl_4$ vapor at low pressures was initiated. Essential to the study was the development of a reactor suitable for continuous operation and permitting accumulation of reproducible kinetic and power yield data.

None of the tubular reactors tested so far overcame successfully difficulties due to deposit of solid particles. In addition, a number of experiments were made with a spherical reactor for the purpose of studying the composition of the solids formed. (auth)

5706

Bureau of Mines, Explosives and Physical Sciences Div.

THE THERMODYNAMICS OF COMBUSTION GASES: TEMPERATURES AND COMPOSITION OF THE COMBUSTION PRODUCTS OF OXYACETYLENE FLAMES. Helen E. Edwards, Robert W. Smith, Jr., and Stuart R. Brinkley, Jr. March 1953. 10p. (BM-RI-4958; AD-7432)

5607

Brookhaven National Lab.

KINETICS OF THE EXCHANGE OF NICKEL-ETHYLENEDIAMINETETRAACETATE ION WITH NICKELOUS ION. Charles M. Cook, Jr. and F. A. Long. Brookhaven National Lab. and Cornell Univ. [Submitted Aug. 26, 1953] 22p. (BNL-1547)

The rate of exchange of hydrated Ni^{++} with the Ni of Ni ethylenediaminetetraacetate ion has been studied by use of radioactive Ni. The rate law is found to be $R = k_1 \times (Ni^{++})(NiY^{--})_0 + k_2 (H^+)(Ni^{++})(NiY^{--})_0 + k_3 (H^+)(NiY^{--})_0 + k_4 (H^+)^2(NiY^{--})_0$ where $(NiY^{--})_0$ refers to the gross concentration of the complex ion. Values of the rate constants have been determined at three ionic strengths. Possible mechanisms for the exchange are discussed. (auth)

5608

Ames Lab.

KINETICS OF THE REACTION BETWEEN LITHIUM AND WATER VAPOR. Bruce E. Deal and H. J. Svec. [July 1953] 32p. (ISC-390)

A critical examination of the reaction between Li and water vapor has been made at 35.0, 45.0, 55.0, 65.0, and 75.0°C. Analyses of the products indicated that LiOH and H_2 are the species formed, corresponding to the equation $2Li + 2H_2O \rightarrow 2LiOH + H_2$. Three rate variables have been examined for this reaction: time, pressure, and temperature. The reaction data have been found to obey the logarithmic rate law $w = k \log(1 + 0.45t)$, where w = weight of water reacted per unit area of Li surface, t = time, and k is the rate constant. It has been shown that the reaction rate decreases as a function of pressure at any particular temperature, becoming independent of the water-vapor pressure when the pressure is reduced below a certain limit. This limiting pressure was found to be approximately 50 mm of Hg at 45.0°C and 60 mm of Hg at 55.0°C. The Arrhenius equation $\ln k = -E/RT + c$, where k = reaction rate constant, E = activation energy, T = absolute temperature, and R and c are constants, was used to determine the activation energy. Values for the activation energy of the Li-water vapor reaction were estimated to be 6.2 kcal/mole when the water vapor pressure was about 50 mm Hg and 5.5 kcal/mole when the water vapor pressure was approximately 100 mm Hg. (auth)

5709

Knolls Atomic Power Lab.

DISSOLVING SODIUM-POTASSIUM ALLOYS. L. P. Pepkowitz. Aug. 12, 1953. 7p. (KAPL-976)

Na-K alloys can be added to solvents without any explosion hazard if the alloy is frozen on dry ice. The solid is cut into small pieces and added to an alcohol-dry ice slurry. The rate of reaction can be controlled by adding more dry ice to the slurry. The CO_2 blanket and the low temperature prevent any reaction with the O in the air. (J.S.R.)

5710

Washington Univ.

HEATS OF FORMATION OF CHROMIUM(II) AND CHROMIUM(III) IODIDES [FOR PERIOD] JANUARY 1953 – JULY 1953. N. W. Gregory and T. R. Burton. Aug. 15, 1953. 5p. (NP-4720; Technical Report 1)

Heats of solution of millimole quantities of $CrCl_2$, $CrCl_3$, CrI_2, CrI_3, KCl, and KI in 750 ml of an aqueous solution 1 molal in KCl, and approximately 0.001 molal in $CrCl_2$ were measured. From these data, and from standard heats of formation for Cr chlorides and K halides, heats of formation of CrI_3 and CrI_2 at 25° were found to be −47.8 and −37.8 kcal/mole, respectively, with an uncertainty of ±3%. (J.A.G.)

5711

Rutgers Univ.

THE INVESTIGATION OF THE ANIONIC COMPLEXES AND POLYMERS OF THE TRANSITIONAL ELEMENTS. E. R. Allen and J. L. Silver. Apr. 20, 1953. 23p. (NYO-3546)

The Raman spectra of solutions, x-ray single-crystal diffraction analysis, x-ray powder methods, and infrared examination of ether complexes were studied as possible analytical methods for studying heteropoly acids. The x-ray single-crystal diffraction technique was found effective in the study of chemical structures of the solids, and the Raman technique was found helpful in the study of solutions. The other methods investigated were not found to be particularly helpful. (For preceding reports in series see also NYO-3544 and NYO-3545.) (C.H.)

5712

Pittsburgh Univ.

STRUCTURE AND BEHAVIOR OF ORGANIC ANALYTICAL REAGENTS. 6. HEATS AND ENTROPIES OF FORMATION OF SEVERAL DIVALENT METAL CHELATES OF 2- AND 4-METHYL-8-HYDROXYQUINOLINE. W. D. Johnston and H. Freiser. [Aug. 12, 1953.] 16p. (NYO-3772)

The Calvin-Bjerrum titration technique for the determination of chelate formation constants has been applied to the Cu(II), Ni(II), Co(II), Zn(II), and Mn(II) chelates of 2- and 4-methyl-8-hydroxyquinoline. Measurements were made at several temperatures in order to evaluate ΔH and ΔS values of chelation. The results obtained were interpreted in terms of steric hindrance of the 2-methyl group. In all cases the heats of formation of the chelates of 2-methyl-8-hydroxyquinoline were remarkably more positive than those for the corresponding chelates of 4-methyl-8-hydroxyquinoline. This large difference in the strengths of the metal-chelate bonds is apparently due to the hindrance of the methyl groups which prevent the close grouping of the two reagent molecules around the metal in chelates of 2-methyl-8-hydroxyquinoline. The lower bond strength in chelates of 2-methyl-8-hydroxyquinoline is partially compensated by a relatively larger entropy of formation. This is attributed to decreased solvent-chelate interaction caused by the shielding of the polar O, N, and metal atoms by the 2-methyl groups. The determination of chelate formation constants of 2-phenyl-8-hydroxyquinoline has been carried out to further extend our study of steric effects in metal chelates. (auth)

5713

Radiation Lab., Univ. of Calif., Berkeley

CHELATION AND CATALYSIS. Melvin Calvin. July 10, 1953. 40p. (UCRL-2254)

A review is given of the general principles of chelation. These principles are then applied to a variety of catalytic phenomena in which chelation is known to play a part, or conceivably might play a part. The examples described are taken primarily from biochemistry, with a few examples from straight synthetic organic chemistry. (auth)

ANALYTICAL PROCEDURES

5714

Brookhaven National Lab.

THE WET CARBON COMBUSTION AND SOME OF ITS

APPLICATIONS (1953 FISHER AWARD LECTURE). Donald D. Van Slyke. [1953] 38p. (BNL-1543)

As the determination of C by dry combustion is quite difficult for many organic compounds, a convenient, precise wet combustion method was developed. A mixture of fuming H_2SO_4 and HIO_3 in an anhydrous medium readily converted organic C to CO_2. The CO_2 could be measured by gravimetric, titrimetric, or gasometric methods. The wet C combustion can be used for the determination of serum proteins, the radioactivity of organic mixtures, and the total fats of blood serum. (J.S.R.)

5715

Ames Lab.

SPECTROPHOTOMETRIC DETERMINATION OF IRON IN VANADIUM, CHROMIUM, MANGANESE, NICKEL AND ZINC: 1,10-PHENANTHROLINE RATE PHENOMENA. D. W. Margerum and Charles V. Banks. July 23, 1953. 16p. (ISC-366)

The use of extraction techniques, differing kinetic rates, and competitive complexing to extend spectrophotometric ferroin analysis to the elements of the first transition series, with the exception of Cu and Co, is discussed. The slow rate of reaction of V, Cr, and Ni with 1,10-phenanthroline permits quantitative formation of tris(1,10-phenathroline)Fe(II) which is then extracted as the perchlorate salt into a nitrobenzene phase, in which its absorbance is determined. Reaction rates of the first transition series metal ions with 1,10-phenanthroline are classified, and deviations from recent theoretical approaches are discussed. Rapid, sensitive, and accurate procedures are given for determination of Fe in V, Cr, Mn, Ni, and Zn. The ferroin perchlorate extraction technique should also be applicable to other systems. (J.A.G.)

5716

Ames Lab.

TITRIMETRIC DETERMINATION OF ZIRCONIUM. James S. Fritz and Myron O. Fulda. July 28, 1953. 12p. (ISC-382)

Macro amounts of Zr are usually determined gravimetrically or by titrimetric means following quantitative isolation of a precipitate. This is time-consuming. A quick, direct titrimetric method for Zr is described. The titration is carried out in acid solution with versene (disodium dihydrogen ethylenediaminetetraacetate), a stable, soluble complex being formed. A visual indicator gives a sharp end point. Fe, Th, Mo, and Bi constitute important interferences but most other metals do not affect the results. Sn and Ti reduce the sharpness of the end point but do not otherwise interfere. This method should be applicable to many specific problems without modification. It also constitutes a new approach to the determination of Zr in more difficult samples. (auth)

5717

Los Alamos Scientific Lab.

A STUDY OF ANALYTICAL PROCEDURES FOR THE DETERMINATION OF SOME ORGANIC NITROGEN COMPOUNDS IN AIR. C. P. Skillern, Jean McClelland, and M. F. Milligan. Apr. 1953. 18p. (LA-1542)

A method for the direct determination of trinitrotoluene in air samples in the presence of o- and p-nitrotoluenes is reported. Polarographic measurements of total o- and p-nitrotoluenes and cyclotrimethylene trinitramine have been studied. A report of the simultaneous determination of o-, p-, and trinitrotoluenes in the ultraviolet region is given. An attempt has been made to separate trinitrotoluene from the mononitrotoluenes. (auth)

5718

NOMOGRAM FOR COUNTING TIME. William C. Davidon. Nucleonics 11, No. 9, 62(1953) Sept.

A nomogram for the determination of counting time for a large number of samples against a relatively constant background is constructed, such that the minimum time compatible with the desired accuracy may be determined. (E.S.)

CRYSTALLOGRAPHY AND CRYSTAL STRUCTURE

5719

Ames Lab.

NUCLEATION OF TETRAPHENYLARSONIUM PERCHLORATE CRYSTALS. Frederick R. Duke and Louis M. Brown. July 25, 1953. 14p. (ISC-257)

Nucleation is considered as being a process competitive with growth of the nuclei. The size of the nucleus is defined by the kinetic order in ions or molecules of the nucleation reaction. The relative rates of nucleation and growth are estimated by counting the number of crystals obtained from a given supersaturated solution. Effects of variation in degree of supersaturation on the number of crystals obtained allows a determination of the number of each kind of ion per nucleus. Variation in the number of crystals with temperature allows determination of the relative activation energies for nucleation and growth. (auth)

5720

Ames Lab.

NUCLEATION OF NICKEL NIOXIME CRYSTALS. F. R. Duke and L. M. Brown. Aug. 4, 1953. 7p. (ISC-386)

Graphs are given to show that a small number of ions form the nucleus of Ni nioxime. The effect of temperature on the number of crystals produced is found to vary considerably with the reagent present in excess. The effect is interpreted as being caused by differences in the mechanism of nucleation or growth, or both, depending on the reagent in excess. This is substantiated by the other data. (auth)

5721

Ames Lab.

POLAR VERSUS NON-POLAR ICE. R. E. Rundle. [Aug. 31, 1953] 3p. (ISC-399)

The residual entropy of polar and nonpolar ice has been recalculated because of errors made in the previous publication (cf. NSA 7-3373). The revised values for residual entropy are 0.72 eu for nonpolar ice and 0.95 eu for polar ice. As the entropy of polar ice is too high, the restrictions of dipole interactions should be used to eliminate all configuration contribution. In view of the recalculation, it is suggested that the "rotational" disorder provides almost the full amount of the residual entropy of water. (J.S.R.)

DEUTERIUM AND DEUTERIUM COMPOUNDS

5722

AN ULTRA-HIGH-FREQUENCY ROTATIONAL LINE OF HDO. Yardley Beers and Samuel Weisbaum. Phys. Rev. 91, 1014(1953) Aug. 15.

King, Hainer, and Cross (Phys. Rev. 71, 433(1949)) predicted that the $3_2 \rightarrow 3_3$ transition of HDO would occur in the uhf region with intensity 2×10^{-7} cm^{-1}. In the present paper the measured frequency of this line was found to be 824.64 ± 0.05 Mc/sec, as compared to a calculated frequency of 824.61 Mc/sec. Revised values of the frequencies of the three Q-branch and one P-branch S-band lines are also tabulated. (L.T.W.)

5723

MICROWAVE SPECTRUM OF DI AT 1.5-mm WAVELENGTH. J. A. Klein and A. H. Nethercot, Jr. Phys. Rev. 91, 1018(1953) Aug. 15.

The microwave spectrum of the $J = 0 \rightarrow 1$ transition of DI^{127} has been observed in the region of 195,000 Mc/sec. The transitions $^5/_2 \rightarrow {}^3/_2$, $^5/_2 \rightarrow {}^7/_2$, and $^5/_2 \rightarrow {}^5/_2$ have been

assigned frequencies 195,320 ± 15, 195,152 ± 8, and 194,776 Mc/sec, respectively. The molecular rotation constant was found to be 97,532 ± 5 Mc/sec. The value of the quadrupole coupling constant is −1805 ± 15 Mc/sec. (L.T.W.)

FLUORINE AND FLUORINE COMPOUNDS

5724
Battelle Memorial Inst.
THE VAPOR PRESSURE OF BERYLLIUM FLUORIDE. K. A. Sense, M. J. Snyder, and J. W. Clegg. [1950] Decl. Aug. 24, 1953. 9p. (AECD-3553; BMI-HWR-55)

Vapor pressures of BeF_2 were measured over the temperature range 746 to 968°C by the transpiration method. The extrapolated boiling point is shown to be 1159°. The melting point is about 803°. (auth)

5725
Argonne National Lab.
KINETICS OF ISOTOPE EXCHANGE REACTIONS OF FLUORINE WITH HALOGEN FLUORIDES. R. M. Adams, R. B. Bernstein, and J. J. Katz. April 1953. 84p. (ANL-5046)

Quantitative kinetic data on the isotope exchange reaction of F_2 with ClF_3, BrF_5, and IF_7 have been obtained using F^{18} tracer. The materials were handled in a metal vacuum line, and the exchanges were carried out in a 2-liter Ni reaction vessel at 3 temperatures in the range 181 to 257°C. While the experimental data do not uniquely determine the mechanism, they strongly suggest that exchange takes place either through a heterogeneous catalysis by the metal fluoride coating on the walls of the reaction vessel, or by a combination of the heterogeneous mechanism plus a homogeneous gas-phase exchange in those cases where a measurable amount of dissociation of the halogen fluoride occurs at the temperature of exchange. It has been shown to be unlikely that the observed exchanges take place through either an atomic mechanism or a purely homogeneous mechanism. It has also been shown that all F atoms in the halogen fluoride molecules are exchangeable. (auth)

5726
Jet Propulsion Lab., Calif. Inst. of Tech.
MEASUREMENT OF HEAT OF DISSOCIATION OF FLUORINE BY EFFUSION METHOD. Henry Wise. May 15, 1952. 13p. (JPL-Memo-20-71; AD-1918)

The heat of dissociation F has been measured by means of the gas-effusion method. These determinations were carried out in a Ni tube which housed a thin-edged circular orifice made of the same material. The rate of gas effusion was determined over the temperature range from 300 to 800°K at a total pressure of 4×10^{-4} mm Hg. The results of these measurements yield for the reaction $F_2(g) = 2F(g)$ a value of $\Delta H^\circ_{298} = 37.6 \pm 0.8$ kcal/mole. (cf, NSA 6-4421) (auth)

5727
Carbide and Carbon Chemicals Co. (K-25)
VISCOSITY OF GASEOUS ANHYDROUS HYDROGEN FLUORIDE. J. C. Posey. Issued Sept. 2, 1953. 28p. (K-1063)

The viscosity of gaseous HF was measured by a rotating cylinder viscometer, and was found to be represented over the temperature range from 22 to 56°C and the pressure range from zero to about one atm. pressure by the equation $\mu = 113.0 + 0.449t - P^2 \times 10^{-4}$ antilog $(10.1/t - 13.2 + 0.2355)$ where μ is the viscosity in micropoises, t is the temperature in degrees centigrade, and P is the pressure in mm of Hg. The equation is not valid outside the limits covered by the experimental data. The following form of the Sutherland equation based on data at zero association over the temperature range of 22 to 88.6°C may be extrapolated to higher temperatures provided the pressure is low enough to prevent appreciable association: $\mu = (T^{3/2}/0.057T + 24.476)$ where T is the temperature in degrees Kelvin. (auth)

5728
Purdue Research Foundation
FLUORINE CONTAINING ELASTOMERS. O. R. Pierce and E. T. McBee. Oct. 1952. 70p. (WADC-TR-52-191(pt.1); AD-1121)

The synthesis of two types of materials, F-containing silicones and F-containing styrenes copolymerized with butadiene, is described. These materials were evaluated as low-temperature, fuel-resistant elastomers. The F-containing silicones were synthesized by routes employing the reaction of a F-containing Grignard reagent with $SiCl_4$ or tetraethyl silicate, followed by hydrolysis of the monomer silane obtained. In particular, the monomer $(C_3F_7CH_2)_2SiX_2$ (X = Cl or OEt) was prepared. Also, a perfluoroalkyl Grignard reagent C_3F_7MgI was synthesized, and its utility in the preparation of perfluoroalkyl silicones was studied. At the conclusion of the first year's work, the achievements indicate that the synthesis of highly fluorinated silicone elastomers is feasible, and the research is being continued. (auth)

GRAPHITE

5729
Alfred Univ.
GRAPHITIZATION OF CARBON; TECHNICAL PROGRESS REPORT. V. D. Frechette and Yung Tao. June 30, 1953. 7p. (NYO-3762)

Study of the improvement of the structure of graphite blocks with special attention to their bulk density was continued. X-ray determination of alignment of cold-pressed powdered graphite was made. Treatment of artificial graphite with HNO_3 made it possible to form strong specimens by simple pressing. (For preceding report see NYO-3761.) (J.S.R.)

LABORATORIES AND EQUIPMENT

5730
PRECISION BALANCES FOR RADIOISOTOPIC APPLICATIONS. Edward J. Hatfield, Jr. Nucleonics 11, No. 9, 48-54(1953) Sept.

Recently developed balances have achieved precisions to 1 ppm in weighing objects up to 5 kg. Remote operation and indication plus weighing-area zoning provide minimum exposure of parts and personnel to radioactivity. (auth)

RADIATION CHEMISTRY

5731
Wisconsin Univ.
THE INFLUENCE OF STRUCTURE, PHASE AND ADDED CHLORINE ON THE ORGANIC YIELDS OF THE $Cl^{37}(n,\gamma)Cl^{38}$ REACTION IN ALKYL CHLORIDES. J. C. W. Chien and J. E. Willard. [1953] 19p. (AECU-2641)

The organic yields of Cl^{38} from the $Cl^{37}(n,\gamma)Cl^{38}$ process in ten liquid alkyl chlorides are all ~22%, independent of structure and chain length. For n-butyl chloride this yield was shown to be independent of dilution with hexane to a mole fraction of 6×10^{-4}. For gaseous n-butyl chloride the yield is about 11% with or without HCl scavenger present, and that from HCl in butane is about 7%. These facts indicate that some of the Cl^{38} atoms produced by the (n,γ) process are activated in such a way that they can react with a hydrocarbon chain in a one step reaction to become organically bound, rather than to form HCl as normal chlorine atoms would do. The organic yields of the liquid hydrogenous alkyl chlorides are not changed by the presence of elemental Cl up to several mole %, whereas that of CCl_4 is reduced. These results support the hypothesis proposed earlier to explain the

scavenger effect of added halogen on (n,γ) induced reactions in alkyl bromides and iodides. The organic yields from seven alkyl chlorides tested in the solid phase at liquid air temperature are all higher than in the liquid, but the ratio to the liquid results varies from 1.4 to 2.7. (auth)

5732

Radiation Lab., Univ. of Calif., Berkeley

SOME EFFECTS OF HEAVY PARTICLE IRRADIATION OF AQUEOUS ACETIC ACID. Warren M. Garrison, Herman R. Haymond, and Boyd M. Weeks. Aug. 1953. 24p. (UCRL-2298)

Oxygen-free CH_3COOH solutions were irradiated with 35-Mev He ions and the irradiation products identified. The yield of succinic acid, at radiation doses of 1×10^{21} ev/ml and below, was found to be independent of beam intensity, but linearly dependent on radiation dose. The radiation yields of succinic acid and H_2O_2 increase with CH_3COOH concentration but approach a limiting value. A possible kinetic scheme for the radiolysis of CH_3COOH is discussed. O-aerated solutions have a decreased yield of succinic acid and an increased H_2O_2 yield. In order to determine the effect of ionization density on radiation yields in evacuated CH_3COOH solutions, a series of irradiations were made with 18-Mev deuterons at a dose rate and total dose identical to that used in the He ion studies. The yield of succinic acid is higher and that of H_2O_2 and H lower. Possible explanations for the decreased H yield are discussed. (J.S.R.)

RARE EARTHS AND RARE-EARTH COMPOUNDS

5733

Ames Lab.

THE SEPARATION OF RARE EARTHS BY ION-EXCHANGE. 7. QUANTITATIVE DATA FOR THE ELUTION OF NEODYMIUM. F. H. Spedding and J. E. Powell. July 31, 1953. 28p. (ISC-383)

The elution of Nd from Nalcite HCR resin beds with 0.1% citric acid-ammonium citrate solutions was investigated, and quantitative measurements were made to determine the distribution of constituents between the aqueous and resin phases. The data obtained in the pH range 5.0 to 8.0 have led to a much clearer understanding of the fundamental mechanisms involved when rare earths are separated by the ion-exchange method. Several basic correlations of the experimental data have been presented. (auth)

5734

Radiation Lab., Univ. of Calif., Berkeley

PROBLEMS IN THE AQUEOUS CHEMISTRY OF CERIUM(III) FLUORIDE AND LANTHANUM(III) FLUORIDE (thesis). John William Kury. July 1953. 64p. (UCRL-2271)

A method for the determination of the solubilities of the rare-earth trifluorides is presented. The extent of the complexing of Fe(III) by the fluoride ion was measured. The resulting data were then used to investigate the solubilities of Ce(III) fluoride and La(III) fluoride and the extent of complexing of Ce(III) and La(III) by the fluoride ion. A calorimetric determination of the heat of precipitation of Ce(III) fluoride is also reported. Results from similar experiments involving Gd are used in discussing trends in the extent of complexing by fluoride ion and in the solubility of the trifluorides through the lanthanide series. (auth)

5735

CARRIER-FREE ISOLATION OF RADIOISOTOPES OF THE RARE EARTHS PRODUCED BY THE NEUTRON CAPTURE REACTION. W. Herr. Angew. Chem. 65, 303-4(1953) June 7. (In German)

A metallic complex is formed by condensation of excess phthalodinitrile in the presence of tri-valent rare earth chlorides at temperatures up to 320°C. The complex is purified by crystallization from organic solvents (as benzonitrile), dissolution, and precipitation with ether. H_2SO_4 may be used to dissolve the complex and vary the pH for the isolation of each rare earth. (J.S.R.)

SEPARATION PROCEDURES

5736

Radiation Lab., Univ. of Calif., Berkeley

LIQUID-LIQUID EXTRACTION. Milton W. Davis, Jr., Thomas E. Hicks, and Theodore Vermeulen. May 1953. Decl. Aug. 18, 1953. 41p. (AECD-3545; UCRL-1013(rev.))

Extraction equipment of the multistage mixer-settler type has been found useful for providing the intensive contact between phases that is required in processes involving complex compounds of the heavy metals. In this report, the factors of mixer-settler design and operation are discussed with reference to the known types of mixer-settler units. Following this review, a detailed description is given of mixer-settler units constructed and installed in this laboratory. (auth)

5737

Ionics, Inc.

A STUDY OF THE SEPARATION OF H AND D DURING ENDOSMOTIC SOLVENT TRANSFER ACROSS CATION-EXCHANGE MEMBRANES. J. A. Marinsky and W. E. Katz. Mar. 10, 1953. Decl. May 5, 1953. 44p. (AECD-3556; NYO-3922)

Experiments have been performed to determine the degree of separation of H and D effected by a cation-exchange resin membrane during endosmotic water transfer. As expected the ratio of H_2O to D_2O transferred was greater than the ratio of H_2O to D_2O in the solution from which transfer occurred, but the separation factor did not exceed 1.07 in any of the experiments performed. Economic production of D_2O by use of a multiplate apparatus cannot be predicted from the results of this study. (auth)

5738

Biophysical Lab., Harvard Medical School

THE SEPARATION OF SODIUM FROM POTASSIUM BY MEANS OF ION-EXCHANGE CHROMATOGRAPHY. Walter L. Arons and A. K. Solomon. Biophysical Lab., Harvard Medical School and Peter Bent Brigham Hospital, Boston. [1952] 16p. (AECU-2661)

A relatively rapid and efficient method for the separation of Na and K by ion-exchange chromatography is presented. Various factors affecting the separation of these alkali metals are discussed, and illustrative experimental data are reported. (auth)

5739

Chalk River Project (Canada)

LIQUID-LIQUID EXTRACTION UNDER CONDITIONS OF CONCENTRATION EQUILIBRIUM. S. D. Cavers. Sept. 15, 1952. 100p. (CEI-52)

An apparatus is described for studying mass transfer in liquid-liquid extraction under conditions of concentration equilibrium using tracer techniques. Values of the over-all transfer coefficient and of the over-all height of a transfer unit have been obtained for the transfer of labeled $FeCl_3$ from an acidic aqueous phase to an isopropyl ether phase. Attempts have been made to correlate these data. The tracer method seems to be a satisfactory way of studying mass transfer in liquid-liquid extraction. The data, however, are not as precise as desired, and suggestions are made for improvements in apparatus and procedure. (auth)

5740

Livermore Research Lab., Calif. Research and Development Co.

EXTRACTION OF NIOBIUM INTO DI-ISOPROPYL KETONE FROM HYDROCHLORIC ACID SOLUTIONS. H. G. Hicks and R. S. Gilbert. Apr. 22, 1953. 8p. (MTA-33)

A method for the extraction of Nb into diisopropyl ketone

from HCl solutions in the absence of HF is described. A new reliable radiochemical separation procedure for Nb based on these findings is outlined. (J.E.D.)

5741
Syracuse Univ.
DISTRIBUTION OF STRONTIUM WITHIN BARIUM SULFATE PRECIPITATED FROM HOMOGENEOUS SOLUTION. Louis Gordon, Carl C. Reimer, and Benjamin P. Burtt. Aug. 19, 1953. 28p. (NYO-3193)

The coprecipitation of Sr with $BaSO_4$ is reported. Fractions of the carrier were precipitated from homogeneous solution by the hydrolysis of methyl sulfate in methanol-water medium. Residual Ba was determined by a complexometric titration procedure using tetrasodium ethylenediaminetetraacetate as titrant. Sr measurements were made using an equilibrium mixture of Sr^{90} and Y^{90}; Kirby's equation was used for the interpretation of all counting rates. Evidence is presented for the existence of a supersaturated condition during the initial stages of the precipitation. A comparison of the conventional precipitation procedure with the homogeneous method indicates that the latter more nearly approaches equilibrium formation of the carrier compound. Over initial Ba to Sr concentration ratios of 1.3 to 2700, Sr appears to be heterogeneously distributed throughout the solid phase; the logarithmic distribution coefficient in the Doerner-Hoskins equation was found to be 0.030 ± 0.004 at 83°. This investigation emphasizes the problems involved in obtaining results in studies of this type of derichment system. (auth)

5742
Columbia Univ.
COLLOIDAL CHARACTERISTICS AND BEHAVIOR OF SOME FLORIDA PHOSPHATE SLIMES. PROGRESS REPORT OF WORK FROM DECEMBER 1, 1952–JUNE 30, 1953. Victor K. La Mer, Robert H. Smellie, Jr., and Pui-Kum Lee. Issued July 30, 1953. 37p. (NYO-3288)

A theoretical equation for the subsidence of flocculated slimes is derived. A physical interpretation of this equation is discussed. Further work is reported on flocculation, subsidence and filtration of slimes, using several flocculating agents. Vacuum filtration experiments were performed in addition to those usually performed with gravity filtration. Microscopic observations of the flocculated slimes have revealed floc structures which can be related to behavior in gravity and vacuum filtration. The efficiency of some of the flocculating agents is dependent upon the temperature of the water during preparation and also upon the age of the preparation. The amount of agitation during the mixing of the slime and the flocculating agent has proven to be an important factor in determining floc size and hence filtration rate. The possibility of correlating the composition of slime solids with the response to flocculating agents is discussed. Consideration is given to flocculation in relation to the nature of the particle surface. Standard methods for determining the electrical condition at the particle surface are discussed. Some preliminary results obtained by applying these methods are reported. Some of the expectations for improving the efficiency of flocculating agents by studies of particle charge are explained. (For preceding period see NYO-3287.) (auth)

5743
Rutgers Univ. School of Chemistry
BEHAVIOR OF THE CONDENSED PHOSPHATES IN ANION-EXCHANGE CHROMATOGRAPHY. [PROGRESS REPORT FOR] FEBRUARY 1, 1952 TO JULY 1, 1953. John Beukenkamp, William Rieman, III, and Siegfried Lindenbaum. Issued Aug. 24, 1953. 40p. (NYO-3440)

Preliminary studies are reported in the application of anion-exchange chromatography to the analysis of mixtures of polymeric phosphates. Equations were developed to describe the elution graphs of the various phosphoric acids as a function of the pH and concentration of the eluant solutions. The reliability of the equations was tested with a number of elutions. Theories of ion-exchange reactions are discussed. (C.H.)

SYNTHESES

5744
Harris Research Labs.
THE CHEMISTRY AND BIOSYNTHESIS OF ISOTOPICALLY LABELED CELLULOSE. PROGRESS REPORT, APRIL 10, 1953. 12p. (AECU-2654)

The mechanism of biosynthesis and the production of cellulose labeled in specific positions with C^{14} has been investigated by means of the biosynthesis of cellulose by Acetobacter Xylinum. Labeled mannitol, glucose, C_2H_5OH, and Na acetate were supplied to the growing bacterium, and at the termination of growth the culture products were examined for radioactivity. With all these nutrients, the major portion of the nutrient was transformed to CO_2. The cellulose from labeled mannitol and glucose was, in part, synthesized from 3-C intermediates derived from the radioactive substrates. The contribution of material from C_2H_5OH or Na acetate to the cellulose is negligibly small. The C^{14} was found only at positions 1, 3, and 4 of the cellulose. (J.S.R.)

URANIUM AND URANIUM COMPOUNDS

5745
Argonne National Lab.
DETERMINATION OF OXYGEN-URANIUM RATIOS IN URANIUM COMPOUNDS. Henry R. Hoekstra and Joseph J. Katz. June 1953. Decl. Aug. 11, 1953. 8p. (AECD-3549; ANL-WMM-1121)

Uranium oxides react quantitatively with BrF_3 to evolve O_2. An apparatus inert to BrF_3 attack has been constructed of Ni, fluorothene, and Teflon. With this apparatus the composition of U oxides in the region UO_2-UO_3 may be determined with an accuracy of better than ±0.5%. (J.S.R.)

WASTE DISPOSAL

5746
Argonne National Lab.
BASIC OPERATIONAL REPORT OF THE ARGONNE ACTIVE WASTE INCINERATOR. Donald C. Hampson, Edwin H. Hykan, and Walton A. Rodger. Feb. 6, 1953. 72p. (ANL-5067)

The active waste incinerator at ANL has been successfully operated for 20 months on a combined routine production and experimental basis. Sixteen thousand cubic feet of wastes have been incinerated with a volume reduction from feed material to ash of 95%. The normal burning rate is approximately 17 ft^3/hr. An experimental program to evaluate equipment performance and to obtain optimum operating conditions has been carried out. The immediate measured activity of the exhaust gas from the gas scrubbing train has been consistently lower than that of the normal outside air. A plot of decontamination factor versus the activity level of the feed indicates that 3×10^7 is the limiting over-all decontamination value for the present operating conditions of the incinerator. This value is confirmed by cumulative decontamination factors for the individual pieces of equipment. (auth)

ENGINEERING

5747
Knolls Atomic Power Lab.
ANALYSIS OF SHORT CYLINDRICAL AND CONICAL

SHELL SECTIONS. C. Linkous and G. Horvay. Apr. 28, 1953. 85p. (KAPL-912)

Simple formulas are developed for the deformations and stresses produced by axisymmetrically applied edge forces and edge moments in cylindrical and conical rings which take shell behavior into account. Formulas are developed for cylindrical and conical shell sections of moderate length. The functions involved (of type $\sinh x/l \cdot \cos x/l$) are tabulated. Formulas are listed for long cylindrical and conical shells (shell length greater than 3 attenuation lengths; the functions involved are of type $e^{-x/l} \cos x/l$) in a form which facilitates computations as compared with earlier versions of these formulas. A method is presented for determining the edge forces and edge moments transmitted by adjacent structures to the shell. The specific case of the pressure vessel with a torispherical head is treated in some detail. (auth)

HEAT TRANSFER AND FLUID FLOW

5748

Institute of Engineering Research, Univ. of Calif., Berkeley
HEAT TRANSFER TO MERCURY IN TURBULENT PIPE FLOW. H. A. Johnson, W. J. Clabaugh, and J. P. Hartnett. July 1953. 63p. (AECU-2627)

Experimental heat-transfer results are presented for turbulent flow of non-wetting Hg in a ¾-in., 18-gage mild-steel tube with constant heat flux. The identical test heat exchanger developed for the previously reported investigation of molten Pb-Bi eutectic was used. This present investigation also includes a series of short-duration tests for possible effects due to (1) secondary flow, i.e., vertical upward vs. downward heated flow, (2) the use of A as an alternate for a He gas atmosphere, and (3) the addition of Mg-Ti amalgam as a wetting agent. Heat-transfer tests with H_2O preceded and followed those for Hg to establish continuing reliable performance of the test exchanger and its instrumentation. The results are correlated for the Peclet modulus range from 200 to 10,000 and are 4 to 10% lower than the previously reported values for Pb-Bi and 35 to 40% lower than the Martinelli-Lyon momentum theory. No difference in heat-transfer performance was noted for upward vs. downward flow or for the use of A as a replacement for the He atmosphere. No visible evidence of wetting occurred on the addition of the Mg-Ti amalgam, and no effect was found in the heat transfer. (auth)

5749

Institute of Engineering Research, Univ. of Calif., Berkeley
HEAT TRANSFER TO LEAD-BISMUTH AND MERCURY IN LAMINAR AND TRANSITION PIPE FLOW. H. A. Johnson, J. P. Hartnett, and W. J. Clabaugh. Aug. 1953. 35p. (AECU-2637)

Experimental heat-transfer results in the low Reynolds modulus range of 1,000 to 10,000 are reported for two different liquid metals, Bi-Pb eutectic and Hg. The single heat exchanger used in both series of tests was a ¾-in., 18-gage, four-ft-long mild-steel tube. Similar heat-transfer tests with water in laminar and turbulent flow were performed with this same tube before and after each liquid metal series, and the agreement of the turbulent-water tests with previous published results supports the liquid-metals test procedure. The experimental Nusselt values decrease from approximately 6 at Reynolds number of 10,000 down to 1 at a Reynolds number of 1,200 and are, consequently, considerably lower than the theoretical laminar-flow Nusselt value of 4.36. The data for both liquid metals, including flow in the upward and downward directions, are correlated on a Nusselt-Peclet basis with a single curve representing all experimental results with a maximum deviation of 20%. (auth)

5750

Oak Ridge National Lab.
MINIMUM WEIGHT ANALYSIS FOR AN AIR RADIATOR–LAMINAR FLOW. W. S. Farmer. July 10, 1953. 37p. (CF-53-3-176)

The net thrust of a nuclear-powered turbojet engine is maximized with respect to minimum weight and pressure drop for a given power output. Component orientation is chosen so as to allow a laminar flow analysis. Heat transfer by a plain-plate-fin-type radiator is considered. (K.S.)

5751

Langley Aeronautical Lab., NACA
STUDIES OF THE USE OF FREON-12 AS A WIND-TUNNEL TESTING MEDIUM. Albert E. von Doenhoff, Albert L. Braslow, and Milton A. Schwartzberg. Aug. 1953. 58p. (NACA-TN-3000)

A number of studies relating to the use of Freon-12 as a substitute medium for air in aerodynamic testing have been made. The use of Freon-12 instead of air makes possible large savings in wind-tunnel drive power. Because of the fact that the ratio of specific heats is approximately 1.13 for Freon-12 as compared with 1.4 for air, some differences exist between data obtained in Freon-12 and in air. Methods for predicting aerodynamic characteristics of bodies in air from data obtained in Freon-12, however, have been developed, which provide substantial agreement in all cases for which comparative data are available. The Freon charging and recovery system used for the Langley low-turbulence pressure tunnel is described. (auth)

5752

Tennessee Univ.
EFFECT OF WETTING ON HEAT TRANSFER CHARACTERISTICS OF LIQUID METALS; PROGRESS REPORT. R. M. Boarts, Harold Chelemer, and Bernard Hoffman. July 31, 1953. 7p. (ORO-100)

This investigation has been undertaken for the purpose of determining the effect of wetting on the heat-transfer characteristics of Hg by studying the characteristics of surfaces used for heat transfer and by employing additive wetting agents. The investigation was conducted along two principal paths: the determination of heat-transfer data over a wide range of flow rates under both wetting and non-wetting conditions and the study of characteristics of various solid metal surfaces in contact with Hg by examination of contact angles and electrical resistivities at the interface. (auth)

MATERIALS TESTING

5753

Little, Arthur D., Inc.
DEVELOPMENT OF A HIGH TEMPERATURE–HIGH EFFICIENCY AIR FILTER: SUMMARY REPORT. Issued Aug. 18, 1953. 48p. (NYO-4527)

A high-efficiency air filter made of noncombustible materials, suitable for use at temperatures of 500°F or higher and resistant to corrosive gases and fumes, has been developed. The filter medium (or paper) is a felt-like material similar in form and appearance to the low-temperature media now in use. It is composed of all-mineral fibers bonded together with a small amount of synthetic resin. Glass fibers of about 3 μ diam. provide 80% or more by weight of the fiber composition. Either asbestos fibers or very fine glass fibers are used with the coarser fiber. Two formulations are recommended, the choice being governed by economics and availability of materials. For low-temperature use the binder does no harm in the filter,

and there is not enough present to be a fire hazard. When the filter is used at high temperature the binder decomposes harmlessly. Practical manufacture of the filter media on commercial equipment has been demonstrated by full-scale paper mill runs, and this report contains recommended mill procedures. A steel-frame filter unit design, using mineral fiber medium and a high-temperature cement, gives a finished product fulfilling the requirements to be met. Filter manufacturers have demonstrated that the unit is a practical production item. The new filter has the same high-efficiency performance and low air-flow resistance as the present low-temperature filters, performance is as good or better at 500°F, it will stand frequent wetting and drying, and it is resistant to many chemicals. Cost will be somewhat higher than for present filters. (For preceding report in series see NYO-1575.) (auth)

5754

Institute of Engineering Research, Univ. of Calif., Berkeley
EQUIPMENT FOR TESTING THE CREEP PROPERTIES OF METALS UNDER INTERMITTENT STRESSING AND HEATING CONDITIONS. Lawrence A. Shepard and John E. Dorn. July 1952. 31p. (WADC-TR-52-101(pt.1); ATI-167643)

A study on the effects of intermittent heating and stressing on the creep and creep-rupture properties of structural sheet materials is reported. Four creep-testing machines, specially designed for this study, with automatic electronic control units are described. This equipment is designed to produce any combination, separately or simultaneously, of intermittent heating and stressing of creep-rupture specimens, in or out of phase. (J.A.G.)

5755

Armour Research Foundation
LOW-TEMPERATURE LUBRICATING ENGINE OIL ADDITIVES. Gilbert Gavlin, Edwin A. Swire, and Sam P. Jones, Jr. Apr. 1953. 365p. (WADC-TR-53-11)

The work reported was carried out to evaluate the limits of utility of commercial pour-point depressants and viscosity-index improvers with mineral oils, to determine the essential structural features of a pour-point depressant, and to extend present knowledge of the mechanism of pour-point depression. The thixotropy exhibited by Pennsylvania 150 Neutral oil below its pour point, studied with rotational concentric-cylinder viscometers, was resolved into two processes occurring simultaneously; a degeneration of the rigid structure, predominantly observed at low rates of shear and occurring very rapidly at high rates of shear and a reversible apparent thixotropy occurring at high rates of shear that is largely attributable to frictional-heating effects. The occurrence of the pour point in wax-bearing mineral oils is considered due to the formation of a rigid network by the solid crystalline components. On shearing these systems, the apparent viscosity decreases to a minimum as a regular function of the work of shearing. The structural requirements of pour-point depressants as fixed by studies of acrylic polymers are indicated to be an alkyl side-chain length of at least 12 carbons and a degree of polymerization commensurate with suitable over-all physical properties. On this basis, polyhexadecylene phthalate was prepared, capable of lowering the pour point of an untreated MIL-L-6082A AN-0-8 1100 Grade oil 30°F. Light, microscopical, and x-ray diffraction studies of the action of additives on blends of synthetic n-paraffin waxes in dewaxed oil support the thesis that pour-point depressants do not enter the crystal lattice but act by means of a surface phenomenon. Review of the previously reported survey of 835 literature and patent references, as well as the evaluation of commercial additives, is given. (auth)

MINERALOGY, METALLURGY, AND CERAMICS

CERAMICS AND REFRACTORIES

5756

New York State Coll. of Ceramics, Alfred Univ.
STUDY OF BASIC MECHANISM OF DIFFUSION OF METALS INTO CERAMIC MATERIALS. PROGRESS REPORT FOR THE PERIOD APRIL 10, 1953–JULY 10, 1953. Robert C. Turnbull and W. G. Lawrence. [nd] 7p. (NP-4735)

The lattice interdiffusion coefficients for Co into single magnesia crystals have been measured over a wide range of temperatures and are described by the equation $D = 1.5 \times 10^{-4} \exp(-53{,}100/RT) cm^2/sec$. The lattice interdiffusion coefficients for Ni in single crystal magnesia may be described by the equation $D = 4.6 \times 10^{-6} \exp(-40{,}500/RT)$ cm^2/sec. (auth)

CORROSION

5757

Argonne National Lab.
ATTACK ON METALS BY LITHIUM. Walter D. Wilkinson and Frank L. Yaggee. Oct. 13, 1950. 37p. (ANL-4990)

Static tests devised to afford a basis for a quick evaluation of the relative resistances of metals to attack by Li are described. Specimens were held for 6 days in Li at 300°C or at 600°C. They were then examined metallographically, and changes in weight and dimensions were determined. In addition, analyses were made of the used Li after completion of the tests. In general, at 600°C low-carbon iron and steel (including type 347 stainless) and Be have the best resistance to attack by Li, and these metals are closely followed by Th and low-carbon, high-chromium (type 430) stainless steel. Al bronze and monel metal are attacked even at 300°C; Ni, inconel, ordinary 18-8 stainless steel, and high-carbon, high-chromium (type 440) stainless steel have intermediate resistance. (auth)

GEOLOGY AND MINERALOGY

5758

Geological Survey
BIBLIOGRAPHY OF U.S. GEOLOGICAL SURVEY TRACE ELEMENTS AND RELATED REPORTS. Diane Curtis and Shirley S. Houser. [1953] 23p. (GS-C-281)

A bibliography has been compiled as a reference guide to Geological Survey reports that have been made available through May 31, 1953. The reports are listed according to the type of publication or release. (J.E.D.)

5759

Grand Junction Operations Office, AEC
AIRBORNE RADIOMETRIC SURVEY OF THE WILLAHA COCONINO COUNTY, ARIZONA AREA. M. L. Nielsen. July 15, 1953. 8p. (RME-31)

The area surveyed included about 400 sq. miles. Flight lines were in accordance with flat topography in the area. The survey showed practically no potential as a future source of U minerals. No further airborne work is recommended. (J.E.D.)

5760

Division of Raw Materials, AEC
PRELIMINARY RECONNAISSANCE OF THE DRIPPING SPRING QUARTZITE FORMATION IN GILA AND PINAL COUNTIES, ARIZONA. W. E. Mead and R. L. Wells. June 1953. 14p., 1 illus. (RME-2003)

A four-week reconnaissance examination of certain

portions of the mountainous area in Gila and Pinal Counties, Ariz., was undertaken to inspect accessible outcrops of Dripping Spring quartzite, a pre-Cambrian formation which has lately attracted the interest of the AEC by the discovery of two separate occurrences of U mineralization. Although no new deposits were found during the field work, a more thorough examination of the quartzite seems warranted. Recommendations for further prospecting by airborne and ground methods are presented, and are based largely on observations made during the brief visit. (auth)

5761

Stanford Univ.

FINAL TECHNICAL REPORT [FOR MAY 1, 1951–JUNE 30, 1953]. PART 1. STUDIES OF THE MINOR CONSTITUENTS IN SOME CALIFORNIA BEACH SANDS. PART 2. OPTICAL AND CHEMICAL STUDIES OF MINERALS CONTAINING TANTALUM, NIOBIUM, TITANIUM AND URANIUM AS A PRELIMINARY TO INVESTIGATION OF THE MINERALOGY OF SOME IDAHO PLACER DEPOSITS. C. Osborne Hutton. Issued June 30, 1953. 55p. (RME-3049)

A study was made of the nature of minerals in blacksand paystreaks, the composition of the heavy minerals in average beachsands, and the distribution and origin of such constituents along a section of the central Calif. coastline. The optical and chemical properties of minerals containing Ta, Nb, Ti, and U were studied. (J.E.D.)

5762

Division of Raw Materials, AEC

POSSIBILITIES FOR URANIUM IN FRENCH MOROCCO. Edward K. Judd and Helen V. E. DeSanctis. Issued Mar. 1953. 62p., 6 illus. (RME-4004)

A general survey is presented of the geography, physiography, mineral production, general geology, and U occurrences in French Morocco. Nearly all the information was obtained from published articles of French geologists. A bibliography of published reports is included. (J.E.D.)

5763

Division of Raw Materials, AEC

URANIUM POSSIBILITIES IN PERU. Edward K. Judd and Helen V. E. DeSanctis. Issued July 1953. 25p., 1 illus. (RME-4024)

The Peruvian mining centers that appear to have characteristics most favorable for the occurrence of U are listed, although local conditions at these localities do not seem to be too favorable for the possibility of developing an industrial supply of the ore. Availability data on certain other listed localities are not sufficiently complete to preclude the possibility of the presence of U and further investigation might prove worthwhile. A number of other localities which might warrant some attention are given. (J.E.D.)

5764

Geological Survey

GEOLOGIC ASPECTS OF THE RESOURCE APPRAISAL OF URANIUM DEPOSITS IN PRE-MORRISON FORMATIONS OF THE COLORADO PLATEAU: AN INTERIM REPORT. W. I. Finch. May 1953. 35p. (TEI-328A)

Uranium deposits in pre-Morrison formations were studied and mapped in all the major U districts of the Colorado Plateau and outlying regions in Utah, Ariz., and N. Mex. Study was concentrated on deposits in the Shinarump conglomerate or lithologic units of that approximate stratigraphic position. Most of the work was of a reconnaissance nature but selected mines were mapped in detail. (J.E.D.)

5765

Geological Survey

RECONNAISSANCE FOR URANIUM-BEARING CARBONACEOUS ROCKS IN CALIFORNIA AND ADJACENT PARTS OF OREGON AND NEVADA. George W. Moore and James G. Stephens. June 1953. 19p. (TEI-337)

A reconnaissance was conducted in Calif. and parts of Oreg. and Nev. in search of new deposits of U-bearing carbonaceous rocks. The principal localities found in Calif. where U occurs in coal are listed here with the U content of the coal: Newhall prospect, Los Angeles Co., 0.020%; Fireflex mine, San Benito Co., 0.005%; American lignite mine, Amador Co., 0.004%; and Tesla prospect, Alameda Co., 0.003%. An oil-saturated sandstone near Edna, San Luis Obispo Co., Calif., contains 0.002% U. (auth)

5766

Geological Survey

DISTRIBUTION OF COARSE- AND FINE-GRAINED ROCKS IN THE WASATCH FORMATION AND THEIR RELATIONSHIP TO URANIUM DEPOSITS, POWDER RIVER BASIN, WYOMING. David F. Davidson. May 1953. 12p. (TEM-676)

A brief study of the areal distribution of the various rock types of the Wasatch formation in the Powder River Basin, Wyo., was made. In the south and central parts of the basin, the Wasatch formation appears to contain coarser-grained rocks in contrast to the northern part, which contains relatively no coarser-grained rocks. The finer-grained rocks are abundant in the northern and central parts of the basin but relatively scarce in the southern part. The known U deposits in the Wasatch are in the central area where coarser-grained sandstones are complemented by abundant finer-grained rocks such as shales and siltstones. (auth)

5767

Geological Survey

RECONNAISSANCE FOR URANIUM IN THE POWDER RIVER BASIN, WYOMING. David F. Davidson. May 1953. 32p., 1 illus. (TEM-677)

A reconnaissance was made of a large part of the Powder River Basin, Wyo., during the summer of 1952 to search for U deposits in parts of the basin other than the Pumpkin Buttes area. No U deposits of economic interest were found, but some rocks of the Tertiary Fort Union formation and the Cretaceous Inyan Kara group were found to be sufficiently uraniferous to justify further search in rocks of these units. Analyses of samples of sandstones, baked shales, and siltstones taken during the reconnaissance show these rocks are considerably more vanadiferous than the average sandstone or clay and shale. (auth)

METALS AND METALLURGY

5768

Battelle Memorial Inst.

INVESTIGATION OF THE POSSIBILITY OF TIME DEPENDENCE OF THE SILVER SELF-DIFFUSION COEFFICIENT. R. D. Johnson and C. A. Mangio. July 13, 1953. 16p. (BMI-851)

The self-diffusion coefficient of Ag^{110} into polycrystalline Ag has been measured for various annealing times at temperatures of 902, 699, and 543°C. At the 2 higher temperatures, no significant variation with annealing time was detected in the diffusion coefficient when the annealing time was varied by a factor of 15 or more. At the lowest temperature, where grain-boundary diffusion is appreciable, the measured diffusion coefficient was observed to decrease with increasing annealing time. This latter result might be expected when grain-boundary and volume diffusion take place simultaneously. (auth)

5769

Knolls Atomic Power Lab.

DIFFUSION STUDIES. 1. THE PERMEABILITY OF TYPE 347 STAINLESS STEEL TO HYDROGEN AND TO TRITIUM.

D. Randall and O. N. Salmon. Mar. 17, 1953. 78p. (KAPL-904)

The permeability of Type 347 stainless steel to H_2 and to T_2 as a function of temperature and pressure has been determined. The significance of the permeability equation has been examined with special emphasis being placed upon the moderately high-pressure region and upon the limiting case of very low pressure. The nature of the rate-controlling processes has been elucidated through consideration of the various activation energies involved. From the practical point of view, the data obtained permit the calculation of the permeability of Type 347 stainless steel to H_2 or T_2 over a pressure range of essentially zero up to about ½ atm. and within a temperature interval of about 550 to 700°C. The results are in good agreement with somewhat similar data obtained by other authors. The permeation rates have been determined by measuring the rate of increase of gas pressure in a constant volume on the downstream side of a cylindrical stainless-steel diffuser for various constant upstream pressures and for two different diffuser temperatures. Precision of the results has been estimated to be 4 to 12% for various conditions. The necessary computations and corrections have been described. (auth)

5770

Cryogenic Lab., Ohio State Univ.

THE HEAT CAPACITY OF TITANIUM FROM 15° TO 305°K. Charles W. Kothen and Herrick L. Johnston. Feb. 24, 1953. 13p. (NP-4729; AD-3199; TR-280-8)

The heat capacities of Ti have been measured in the temperature range 15 to 305°K, and the derived thermal functions have been calculated and tabulated at integral values of the temperature over this range. The entropy at 298.16°K is 7.33 ± 0.02 entropy units. (auth)

5771

Cryogenic Lab., Ohio State Univ.

THERMAL EXPANSION OF ZIRCONIUM BETWEEN 290° AND 1600° K. Gordon B. Skinner and Herrick L. Johnston. Mar. 16, 1953. 9p. (NP-4737; TR-280-9)

The average coefficients of thermal expansion of hexagonal Zr between 298 and 1143° K are 5.5×10^{-6} deg^{-1} along the a-axis, 10.8×10^{-6} deg^{-1} along the c-axis, and 7.2×10^{-6} deg^{-1} for a randomly oriented polycrystalline sample. The average value of the linear coefficient of expansion of cubic Zr between 1143 and 1600° K is 9.7×10^{-6} deg^{-1}. At the transition there is a decrease in volume of 0.66%. (auth)

5772

Armour Research Foundation

DEVELOPMENT OF TRANSFORMATION DATA FOR SPECIAL TITANIUM ALLOYS; CONTRACTOR'S LETTER REPORT FOR THE PERIOD JULY 1, 1953 TO JULY 31, 1953. D. J. DeLazaro and D. J. McPherson. 3p. (NP-4762; Contractor's Letter Report 1)

The evaluation of the transformation characteristics of the high-temperature β phase for each of a number of Ti-base alloys is briefly outlined. (J.E.D.)

5773

Institute of Engineering Research, Univ. of Calif., Berkeley

THE CORRELATION OF HIGH TEMPERATURE RUPTURE DATA FOR NIOBIUM. Raymond L. Orr and Douglas W. Bainbridge. July 1, 1953. 11p. (NP-4766; Technical Report 28)

Stress-rupture data for Nb were obtained at 1144°K under 4 stress conditions between 18,000 and 25,000 psi. These data correlated well with existing rupture data for the same material at 1255°K. The experimental activation energy for rupture was found to be equal to 75,000 cal/mole for Nb. (auth)

5774

ON THE MECHANISM OF PLASTICITY IN HOMOGENEOUS METAL ALLOYS AT HIGH TEMPERATURES. K. A. Osipov. Translated by Gelbtuch from Izvest. Akad. Nauk S.S.S.R. Otdel. Tekh. Nauk 9, 1372-7(1949). 9p. (AEC-tr-1600)

The increase of heterogeneity appears to be one of the chief mechanisms of plastic deformation in homogeneous metal alloys. Ni-Cr and Fe-Cr-Ni-Mn alloys were annealed and subjected to bend tests to test the validity of this assumption. The cast-alloy specimens were annealed and subjected to bend tests at 1100°C for the binary alloys and 800°C for the quarternary alloys. Several of the initially homogeneous alloys behave under tension as if they had become heterogeneous, although microscopic investigation failed to show any noticeable evidence of phase separation. (J.S.R.)

5775

ON THE EFFECT OF CERTAIN DISSOLVED ADMIXTURES ON THE FRONTAL DIFFUSION OF SILVER INTO POLYCRYSTALLINE COPPER. V. I. Arkharov, S. I. Ivanovskaya, and N. N. Skornyakov. Translated from Doklady Akad. Nauk S.S.S.R. 89, 669-72(1953). (NSF-tr-58; D-89-669)

The effects of small amounts of Fe in Cu on the diffusion of Ag into Cu and the effect of the simultaneous presence of 2 or 3 admixtures (Sb + Be, Sb + Fe, Be + Fe, Sb + Be + Fe) are reported. The formations of projections of the diffusion front, with reference to speed, shape, penetration, etchability, and coloring, for Cu-Fe alloys containing 0.001 to 0.04% of Fe and Cu containing homophilic admixtures (Sb, Be, and Fe) are discussed. Experimentation with the diffusion of Ag into Cu samples containing various combinations of admixtures with different concentration ratios showed that, for every given concentration ratio of the homophilic admixtures, the nature of the Ag diffusion is mainly affected by one of the admixtures. Consequently, for every qualitatively and quantitatively different combination of admixtures studied, one predominates in the internal intercrystalline absorption. However, instances of the joint absorption of different admixtures are possible when their effects are added, as was particularly apparent in Cu with 0.5% of Be and 0.004% of Fe; the Be only partially eliminated the accelerating effect of Fe on the diffusion of Ag along the grain boundaries but nevertheless lowered it considerably. (J.A.G.)

5776

X-RAY ANALYSIS OF THE AGING OF Al-Zn ALLOYS. A. M. Elistratov [Yelistratov]. Translated from Doklady Akad. Nauk. S.S.S.R. 88, 803-6(1953). 5p. (NSF-tr-65; D-88-803)

An abstract of this article appears in Nuclear Science Abstracts as NSA 7-4822.

5777

ROLE OF GRAIN BOUNDARY IN THE PROCESS OF PLASTIC DEFORMATION IN ALUMINUM. E. S. Yakovleva and M. V. Yakutovich. Doklady Akad. Nauk S.S.S.R. 90, 1027-9(1953) June 21. (In Russian)

The role of grain boundaries in plastic deformation fluctuates sharply with variations in the conditions of deformation. At low temperatures and high rate of deformation the grain boundaries inhibit slip deformation. With a rise in temperature the damping influence diminishes. At high temperatures and low rate of deformation the boundaries display sites of metal sag with localized deformation in the boundary. The various roles of grain boundaries under different conditions of deformation are dependent on the different mechanisms of plastic deformation. At low temperatures and high rate of deformation the mechanism is essentially an atomic-diffusion process. The characteristics of pure Al in the range of high temperatures are conclusive evidence of the existence of transitory layers in the boundaries of single crystals. (J.S.R.)

PHYSICS

5778
Argonne National Lab.
PHYSICS DIVISION QUARTERLY REPORT [FOR] DECEMBER 1952, JANUARY [AND] FEBRUARY 1953. May 1953. 140p. (ANL-5031)

Progress is reported on the following projects: experimental investigations on the design and operation of a fast-neutron velocity selector; liquid scintillation neutron detector design and testing; neutron velocity selector transmission measurements and resonance separation for several isotopes of Cd, Gd, Mn, Hg, Zn, and Mo; installation of a Van de Graaff generator; the Argonne Van de Graaff generator r-f ion source; the design of a scintillation coincidence spectrometer and the use of this machine for decay-scheme determinations of Ir^{192}, Dy^{165m}, Dy^{165}, Gd^{159}, and Gd^{161}; the decay schemes of Rh^{104}, Rh^{104m}, Sm^{151}, Eu^{152}, Gd^{153}, Eu^{154}, Eu^{155}, and Sc^{48}; internal conversion of the capture α rays of Gd; neutron scattering cross sections of several Ti isotopes; photodisintegration of Be^{9}; thermal neutron capture cross section for H; activation cross sections for Co^{60}, Cu^{64}, Ge^{75}, Ba^{139}, and W^{187}; pile absorption cross section for Na^{23}; calibration of a Ra-Be neutron source; mass spectrographic experiments currently in progress; crystal structure determinations of Tc compounds; theoretical investigations of the jj-coupling model for light nuclei; triple α cascade of Ti^{48}; emission of monoenergetic neutrons from charged-particle reactions, spin orientation of polarized neutrons passing through magnetized Fe; quantization of space-time; scattering of photons by atoms; digital computer investigations on the operation, maintenance, and improvement of errors in the electrostatic memory system of the AVIDAC; test routines for the Argonne computer; operation of the ORACLE; applied mathematical computations by the use of IBM tab plug-boards, together with a tabulation of range limitations for several functions of real arguments. (K.S.)

5779
Ames Lab.
QUARTERLY SUMMARY RESEARCH REPORT IN PHYSICS FOR JANUARY, FEBRUARY, AND MARCH 1953. June 10, 1953. 16p. (ISC-338)

Progress is reported on the following studies: β spectrum and half life of P^{33}; transmission curves for counter windows; stars produced in nuclear emulsions by high-energy x rays; ionization defect for fission fragments; electrical resistivity, Hall coefficient, diffusion of Na, and linear expansion coefficients in Na-W bronze; electrical properties of Mg_2Sn and crystalline β; and lattice constants and magnetic properties of Er. Abstracts were given of papers on conduction in thin films, variational methods for problems in resistance, and a d-c magnetic ion source. (For preceding period see ISC-301.) (J.S.R.)

5780
Ames Lab.
DESIGN AND ANALYSIS OF A 100 CYCLE HALL EFFECT SYSTEM. A. A. Read, C. J. Kevane, and E. B. Harris. Aug. 11, 1953. 25p. (ISC-387)

Hall effect measuring apparatus is described in which an alternating current is passed through the sample and a 100-cps narrow-band amplifier is used for measuring both the current through and the Hall voltage across the sample. A theoretical approach followed by descriptive and analytical information permits the duplication of the equipment. The narrow-band amplifier has a gain of 80×10^6 and a bandwidth of one cps. The oscillator and power amplifier used to supply the current through the sample are described also. (auth)

5781
Carbide and Carbon Chemicals Co. (K-25)
STEAM CONDENSING FILM COEFFICIENTS ON A VERTICAL, DEFINED, COPPER TUBE AFTER OLEIC ACID FLUSHING. W. H. Stahlheber, J. E. Baker, and J. W. Michel. Issued Aug. 20, 1953. 20p. (K-1046)

A series of tests have been run on a multi-tube freon evaporator to determine the effect of oleic acid as a drop-wise steam condensation promoter on that surface. The oleic acid has little beneficial effect. The values of the steam-condensing-film coefficient obtained and the variation of the coefficient with time at constant operating conditions are discussed. The results are substantiated and explained by the observations of other experimenters. A short explanation of the theory of drop-wise condensation promotion is included. (auth)

5782
Radiation Lab., Univ. of Calif., Berkeley
TIME QUANTIZATION IN A FEEDBACK SYSTEM. John F. Waddell and Harold D. Morris. May 1953. 39p. (UCRL-2208)

Effects observed in an otherwise linear system wherein time is quantized are discussed. The physical process of time quantization in a feedback system is analyzed, and complications resulting therefrom are pointed out. Spectral composition of the output of a clamped-type time quantizer is discussed in a manner applicable to time quantizers having any output pulse shape. On the basis of the spectral analysis, a transfer function is developed which is applicable to signals of all frequencies. Linear passive approximations to the transfer function are developed, including one which is physically realizable, which are applicable to signals having periods longer than two quanta of time. The results of the analysis are applied in a new criterion for stability of a time-quantized feedback system. Experimental verification of the theoretical results is demonstrated. (auth)

5783
Radiation Lab., Univ. of Calif., Berkeley
PHYSICS DIVISION QUARTERLY REPORT, FEBRUARY, MARCH, AND APRIL, 1953. June 10, 1953. 41p. (UCRL-2241)

Nuclear physics research reported includes: reactions of 270-Mev neutrons on He and D and of 32-Mev protons on He; meson spectrum of C bombarded by protons; high-energy γ-ray spectroscopy; fast deuterons from 340-Mev protons on C; the reaction ($p + d \rightarrow t + \pi^+$); detection efficiency of counting equipment; photoproduction of neutral and negative pions from D; production of tritons from d-d collisions; $p + p \rightarrow D + \pi^+$ cross section at 338, 332, and 324 Mev; resonance excitation of delayed heavy-particle emitters; increase in the external beam of 60-in. cyclotron using strong focusing; elastic p-d scattering at 345 Mev; proton-proton scattering at 170 and 260 Mev; n-p scattering at small proton angles; attenuation of positive pions in H; meson-nucleon equation in the adiabatic limit; high-energy Compton scattering; and theory of the fine structure of the synchrotron beam. The modifications of the 184-in. cyclotron are discussed. The 60-in. cyclotron has been shielded in order to bring the cyclotron beam entirely out of the magnetic field. The removable target chamber and centerline probe chamber are described. Cross-dee feelers can be placed on the existing horizontal feelers without disturbing the tank vacuum. A thermistor bridge is now being used to monitor the internal beam current. (For preceding period see UCRL-2152.) (J.S.R.)

COSMIC RADIATION

5784
ABSORPTION OF COSMIC-RAY PARTICLES GENERATING ELECTRON-NUCLEAR SHOWERS. S. A. Azimov, A. L. Lyubimov, and K. P. Ryzhkova. Translated from Doklady Akad. Nauk S.S.S.R. 90, 51-4(1953). 4p. (NSF-tr-62; D-90-51)

The absorption of particles generating electron-nuclear showers in graphite, Fe, and Pb was measured. A hodoscopic arrangement was used with Pb between adjoining counters. The results of the measurement are tabulated. A comparison of the absorption values showed the absence of transition. The absorption value for graphite is substantially greater than that for air. In Pb, absorption is smaller than in a graphite layer of equal mass. The absorption of nuclear-interacting particles and the secondary nuclear-interacting particles produced by them takes place after about 3 interactions with the nuclei. (J.S.R.)

5785
HIGH ALTITUDE MEASUREMENTS OF THE INTENSITY OF COSMIC RADIATION AT MAGNETIC LATITUDES 3°N AND 19°N. A. S. Rao, V. K. Balasubrahmanyan, G. S. Gokhale, and A. W. Pereira. Phys. Rev. 91, 764-5(1953) Aug. 1.

The total intensity and penetrating component of cosmic radiation in the vertical direction have been measured as a function of altitude in Bangalore, magnetic latitude 3°N, and Delhi, magnetic latitude 19°N, during the years 1951 to 1953. The intensity of the component penetrating 10 cm of Pb absorber at 3 and 19°N increases continuously with decreasing pressure, reaches a maximum at a pressure of 120 millibars, and then falls with further decrease in pressure. The total intensity at 3 and 19°N increases rapidly with decreasing pressure, passes through a maximum at 200 millibars, and then decreases rapidly to the lowest pressure obtained. (L.T.W.)

CRYSTALLOGRAPHY AND CRYSTAL STRUCTURE

5786
Radiation Lab., Univ. of Calif., Berkeley
MADELUNG CONSTANTS AND COORDINATION. David H. Templeton. July 20, 1953. 5p. (UCRL-2282)

The Madelung constant per valence bond is defined as $\alpha = 2A(R_0)/z_a z_c n$, where R_0 is the shortest anion-cation distance, n is the number of ions, and z_a and z_c are the anion and cation charge numbers. A linear relationship can be obtained between the various formula types and α by taking α as a function of the reciprocal of the harmonic mean coördination number. The linear relationship can be used to predict the Madelung constants of ionic crystals. (J.S.R.)

5787
DIFFRACTION OF X-RAYS IN BENT CRYSTALS. KINEMATIC THEORY FOR THE CASE OF TRANSMISSION. I. B. Borovskii [Borovsky] and P. A. Bezirganyan. Translated from Doklady Akad. Nauk S.S.S.R. 88, 639-42(1953). 5p. (NSF-tr-55; D-88-639)

The mathematical analysis of x-ray diffraction in bent crystals for the case of a three-dimensional lattice has been developed on the basis of the kinematic theory of x-ray interference. The following assumptions were made in solving the problem: the original plane-parallel crystalline plate absolutely elastic; the periods of the lattice remain constant after binding throughout the crystal; the incident x-ray wave is plane and monochromatic; and the waves scattered by the various atoms of the bent crystal in the direction of the point of observation are parallel. The results of the two-dimensional case are extended to the three-dimensional one by treating the circular cross section as a point with scattering power equal to that of the plane. The conditions for the appearance of the transmission maxima (for first-order reflections) are calculated. (J.S.R.)

5788
DIFFRACTION OF X-RAYS IN BENT CRYSTALS. KINEMATIC THEORY FOR THE CASE OF REFLECTION. I. B. Borovskii [Borovsky] and P. A. Bezirganyan. Translated from Doklady Akad. Nauk S.S.S.R. 88, 769-72(1953). 3p. (NSF-tr-56; D-88-769)

A solution for the case of reflections in the three-dimensional lattice of a bent crystal is developed in a manner similar to that for diffraction. The conditions for the interference maxima are calculated. (J.S.R.)

ELECTRONS

5789
RADIATIVE CORRECTIONS TO SCATTERING OF ELECTRONS BY ELECTRONS. A. Akhiezer [Akhiyezer] and R. Polovin. Translated from Doklady Akad. Nauk S.S.S.R. 90, 55-7(1953). 3p. (NSF-tr-47; D-90-55)

The interaction of an electron with the zero-point oscillations of an electromagnetic field and the polarization of the electron-positron vacuum determine the radiative corrections to the scattering of electrons by electrons. The elements of the scattering matrix are given. In the non-relativistic region the radiative corrections move toward zero with the velocity of the electrons. (J.S.R.)

5790
RADIATION FROM FAST ELECTRONS IN A MAGNETIC FIELD. A. A. Sokolov, N. P. Klepikov, and I. M. Ternov. Translated from Doklady Akad. Nauk S.S.S.R. 89, 665-8 (1953). 5p. (NSF-tr-54; D-89-665)

A brief abstract of this article appears in Nuclear Science Abstracts as NSA 7-5393.

5791
AUGER ELECTRON INTENSITIES. R. D. Hill. Phys. Rev. 91, 770-1(1953) Aug. 1.

The difficulty of making accurate calculations of the Auger effect lies in obtaining accurate electron wave functions. An estimate of the relative Auger electron intensities has been carried out with the heuristic viewpoint that Auger transition intensities are proportional to the products of the separate L or K x-transition probabilities and the L subshell conversion coefficients. (L.T.W.)

INSTRUMENTS

5792
David Sarnoff Research Center
ELECTRONIC DEVICES FOR NUCLEAR PHYSICS; QUARTERLY REPORT [FOR] JANUARY 1953–APRIL 1953. G. A. Morton, P. W. Davison, M. W. Green, M. H. Greenblatt, and A. H. Sommer. June 23, 1953. 25p. (AECU-2640; Quarterly Report 11)

Basic investigations of photomultiplier cathode fabrication from $SbLi_3$, emission characteristics of $SbLi_3$ and $SbCs_3$, and the development of high-sensitivity photomultiplier tubes are reported. Specific design considerations of current high-sensitivity photomultipliers are given in detail. (For preceding period see AECU-2528.) (K.S.)

5793
Atomic Energy Research Establishment, Harwell, Berks (England)
THE USE OF Tl^{204} IN RADIOACTIVE STATIC ELIMINATORS. J. F. Cameron. June 30, 1953. 18p. (AERE-I/R-1216)

Measurements of the discharge current of a standard 30 mc Tl^{204} static eliminator operating with a charged metal plate are described. The probable performance of such an eliminator in discharging sheets of insulating material is deduced. (auth)

5794
Brookhaven National Lab.
MODIFIED NORRIS ELECTRIC TAPE. Wallace de Laguna, Geological Survey. [nd] 13p. (BNL-1534)
An apparatus for water-level depth measurement in deep wells is described. A steel tape is connected in series with an ammeter, one side of which is grounded to the well casing. Completion of the circuit by immersion of the tape tip causes a meter deflection, and the water depth is read directly from the tape. (K.S.)

5795
Ames Lab.
A METHOD OF CORRECTING FOR FILM SHRINKAGE. James M. Dickinson and Phil E. Armstrong. [Aug. 13, 1953]. 5p. (ISC-392)
A device to punch fiducial marks on x-ray film has been constructed to allow a correction to be made for film shrinkage. The punch is made of stainless steel except for a strip of Teflon in the base to protect the needle points. Comparison of unprocessed film with processed film gives the correction factor. (J.S.R.)

5796
Los Alamos Scientific Lab.
RECENT DEVELOPMENTS IN PULSE HEIGHT ANALYZER DESIGN. C. W. Johnstone. Sept. 1952. 31p. (LA-1420)
The increasing need for pulse-height analyzers in the field of nuclear physics is being met at Los Alamos by a number of new single and multichannel analyzers of original design. Use is made of an expander or window amplifier, and the peculiar properties of the 6BN6 tube type are utilized in the channel circuits. Narrow channel width stability, high speed, and versatility are achieved with a minimum number of tubes. (auth)

5797
Office of Basic Instrumentation, National Bureau of Standards
PHOTOELECTRIC COUNTER FOR AN INTERFEROMETRIC CALIBRATION DEVICE. H. R. Smith and D. R. Tate. June 1953. 11p. (NBS-2536)
A simple photoelectric device for counting linear interference fringes as they move across the field of a pair of interferometer plates is described. The device was developed in the course of a project to survey and evaluate autographic stress-strain recording systems. (auth)

5798
National Bureau of Standards
SURVEY OF ANALOG-TO-DIGITAL CONVERTERS. C. W. Bower. July 1953. 30p. (NBS-2755)
This report summarizes the background and fundamentals of analog-to-digital conversion devices and techniques. The advantages of such conversion are reviewed, and specification considerations are outlined. Details of several widely known converters are discussed. (K.S.)

5799
Electrical Engineering Research Lab., Univ. of Texas
FINAL ENGINEERING REPORT ON THE TYPE I AIRBORNE MICROWAVE REFRACTOMETER. C. M. Crain. Dec. 15, 1952. 44p. (NP-4668; AD-5559)
The refractive index of a sampled medium is determined by mixing the output of a N-filled cavity resonator standard with the output of a sampling resonator. The beat frequency produced, proportional to the index of the sample, is fed to a discriminator which is linear over a 4-Mc range. The discriminator output voltage is amplified and read directly on a recording meter. A complete circuit design analysis is presented for all parts of the instrument. (K.S.)

5800
Radiation Lab., Univ. of Calif., Berkeley
APPLICATION AND OPERATION OF THE UCRL DIFFERENTIAL ANALYZER. John Killeen. June 8, 1953. 36p. (UCRL-2239)
Solution of differential equations by the UCRL differential analyzer is explained. A description of the machine from a functional point of view is included, and an explanation of the method of setting up equations for analyzer solution is given. Operating procedures peculiar to this instrument are also included. (auth)

5801
Radiation Lab., Univ. of Calif., Berkeley
THE "MECHANICAL PARTICLE," AN ANALOGUE COMPUTING MACHINE. Bayard Rankin. July 10, 1953. 16p. (UCRL-2272)
A machine is described which solves the equations of motion for a charged particle in a two-dimensional magnetic field. Its accuracy is not limited by the steepness or the asymmetry of the field. Guided by remote control, the mechanism moves continuously over a contour map just as a particle would move through the field itself. The operator matches position, or local field value, with a parameter of the steering control or curvature of the trajectory. He is able to interpolate continuously between lines of constant field value, thus speeding the process of solution and increasing the accuracy. In five minutes a 40-in. orbit can be drawn over which the field values vary through 23,000 gauss. Five min are required for introducing initial conditions, including momentum. For regions in which the field is more than half maximum, the orbits of the mechanical particle and the electromagnetic particle coincide in their radii of curvature to within 0.5%. Accuracy is less for low field values. The performance characteristics have been determined from a working instrument which is fully described. An alternative computer design to the one already in use is also discussed. (auth)

5802
PORTABLE AIR SAMPLER FOR COLLECTION OF RADIOACTIVE DUST. Bernard Reich. Nucleonics 11, No. 9, 63 (1953) Sept.
A portable air-sampling unit designated as MX1191( )/TDQ-1 has been constructed in which the air is drawn through a filter-paper disk by a battery-powered blower. Activity is measured with an ionization chamber type of survey instrument. (E.S.)

ISOTOPES

5803
Livermore Research Lab., Calif. Research and Development Co.
THE 1.25 MINUTE Rb^{82m} DAUGHTER OF 27 DAY Sr^{82}. L. M. Litz, S. A. Ring, and W. R. Balkwell. Issued Aug. 1953. 13p. (MTA-46)
The 3.15-Mev positron associated with the decay of the 27-day Sr^{82} has been found to arise from the decay of a 1.25-min metastable Rb^{82} isomer by an allowed transition to the Kr^{82} ground state. No isomeric transition to the 6.3-hr Rb^{82} ground state was observed. A tentative decay scheme and spin and parity assignments are discussed. (auth)

5804
Radiation Lab., Univ. of Calif., Berkeley
A SEARCH FOR B^{13}. Edward L. Hubbard, Lawrence Ruby, and Warren F. Stubbins. Aug. 21, 1953. 4p. (UCRL-2306)
When various elements were bombarded with 340-Mev protons and 190-Mev deuterons, no neutron activity was found which would correspond to the decay of B^{13} as a delayed neutron emitter with a half life in the range from 0.5 msec to 0.5 hr. (auth)

MASS SPECTROGRAPHY

5805
Jet Propulsion Lab., Calif. Inst. of Tech.
AN IMPROVED RADIO-FREQUENCY MASS SPECTROM-

ETER AND A NEW METHOD FOR INTERPRETING DATA. Bertram Keilin. Nov. 25, 1952. 19p. (JPL-PR-24-4; AD-686)

A new tube has been designed and built which improves the performance of the r-f mass spectrometer. In addition, a number of changes have been made in the auxiliary electronic circuits to eliminate interference from both external and internal noise. A new method of interpretation of mass patterns is presented which extends the useful range of operating pressure in a mass spectrometer to 10^{-4} mm Hg. This method is exemplified by calibration curves obtained with CO_2 gas. (auth)

MATHEMATICS

5806

[Kenyon Coll.]

A MATHEMATICAL APPARATUS FOR QUANTUM MECHANICS. PART 3. CANONICAL DIAGONAL REPRESENTATION OF MAXIMAL NORMAL OPERATIONS. Otton Martin Nikodym. [nd] 120p. (AECU-2673)

Detailed mathematical methods are presented according to the following topics: Hermitian self-adjoint operators and their diagonal representation; a theorem on measurable sets of space-traces; the auxiliary correspondence T_p^* between measurable sets of s_0-traces and some sets of F_0-traces and the correspondence between functions generated thereby; and canonical correspondence and canonical diagonal representation of normal operators. (For Part 2 of the series see AECU-2454 appearing as NSA 7-2850.) (K.S.)

5807

National Bureau of Standards

PROJECTS AND PUBLICATIONS OF THE NATIONAL APPLIED MATHEMATICS LABORATORIES: A QUARTERLY REPORT FOR APRIL THROUGH JUNE 1953. 89p. (NBS-2688)

Projects and publications of the Institute for Numerical Analysis, Computation Lab., Statistical Engineering Lab., and Machine Development Lab., including lists of lectures and symposia, are presented. (J.E.D.)

5808

Oak Ridge National Lab.

A GENERAL THEORY OF STOCHASTIC ESTIMATES OF THE NEUMANN SERIES FOR THE SOLUTIONS OF CERTAIN FREDHOLM INTEGRAL EQUATIONS AND RELATED SERIES; MATHEMATICS PANEL. G. E. Albert. Issued Aug. 28, 1953. 48p. (ORNL-1508)

The aim of this report is to present: (1) the application of rigorous stochastic-process theory to the generation of a unified theory of estimation processes for the solution at a single point, (2) the application of elaborate sampling schemes based upon simple distribution functions in an attempt to realize an over-all computing efficiency by appropriate balance between statistical efficiency and machine efficiency, and (3) the estimation of the entire function $\phi(x)$ by a weighted interpolation of many single-point estimates of ϕ. Related estimation problems are mentioned only briefly. (auth)

5809

Oak Ridge National Lab.

A TWO SAMPLE PROCEDURE FOR LINEAR DISCRIMINATION IN NORMAL SAMPLES. Jack Moshman. Issued Aug. 28, 1953. 93p. (ORNL-1582)

Let y be a random variable, normally distributed with constant, unknown variance σ^2 and with a mean that is an unknown linear function $y = \alpha^* + \beta^* x$ of a non-stochastic, continuous variable x. The problem of discrimination assumes that there exist a set of observations on y corresponding to a single, unknown value, x_0, of x. It is desired to devise an experimental procedure which will enable one to construct a confidence region for x_0 with confidence coefficient $1-\gamma$, $0 \leq \gamma \leq 1$. It is shown that the usual one-sample procedure is inefficient. The confidence coefficient always exceeds $(1-\gamma)$ by an amount that is a function of β^*/σ. A two-sample experimental procedure is developed for constructing a confidence interval for x_0, independent of σ, which, whenever β^* is outside some specified region of indifference about zero, will have a confidence coefficient not greater than $(1-\gamma+\delta)$, where δ is an arbitrary positive number $<\gamma$. The two-sample procedure enables one to make the confidence coefficient independent of σ at the expense of making the sample size a random variable dependent on σ. The discrimination problem in the case of normal, multiple, linear regression is discussed and found to be quite analogous to the simple regression model. The two-sample procedure is extended specifically to the three-dimensional case, but the formal extension to the n-dimensional situation, for arbitrary n, is immediate. (auth)

5810

SELF-OSCILLATIONS IN ESSENTIALLY NONLINEAR QUASI-CONSERVATIVE SYSTEMS. G. V. Savinov. Translated from Doklady Akad. Nauk S.S.S.R. 89, 995-97(1953). 3p. (NSF-tr-60; D-89-995)

Equations for the self-oscillations in a nonlinear, quasi-conservative system are derived. A periodic solution is sought for the equation $\ddot{x} + g(x) = \mu f(x,\dot{x},\mu)$ of the form $x(t) = x_0(t) + A(t)\beta_1 + B(t)\beta_2 + C(t)\mu + \ldots$, where μ is a quantity describing the nonconservative nature of the system, and A, B, etc. are the functions to be determined. $x_0(t)$ is deduced as a solution of the particular equation, and final results are achieved by the use of elliptic functions. It follows from the analysis that departures from the harmonic form of the self-oscillations is a function of the nonlinearity of the system. (K.S.)

MEASURING INSTRUMENTS AND TECHNIQUES

5811

Illinois Univ. Coll. of Medicine

EXTRAPOLATION IONIZATION CHAMBER FOR MEASUREMENT OF DOSAGE IN INTRACAVITARY IRRADIATION. Armand Littman, Benum W. Fox, J. W. Beattie, and John S. Laughlin. [nd] 9p. (AECU-2658)

A modification of the extrapolation ionization chamber is described. A spherical phantom is incorporated in the chamber in order to simulate intracavity use. Determination of an absorption curve and the radiation pattern was made with a small cylindrical source of $Ru\text{-}Rh^{106}$. (auth)

5812

Atomic Energy Research Establishment, Harwell, Berks (England)

SOME COLD CATHODE VALVE CIRCUITS USED IN THE MEASUREMENT OF RADIOACTIVITY. D. H. Peirson. Mar. 1953. 10p. (AERE-EL/R-1204)

For the purpose of surveying and monitoring levels of natural radioactivity, circuits employing cold-cathode tubes have been designed to operate from G-M and scintillation counters. These circuits exploit the low-power consumption and robustness of the cold-cathode tube compared with the conventional hard tube. Considerable practical use has demonstrated the reliability of these methods. Application in other fields is indicated. Use of the cold-cathode tube at the higher counting rates is restricted by deionization time. (auth)

5813

Atomic Energy Research Establishment, Harwell, Berks (England)

CHERENKOV RADIATION: A BIBLIOGRAPHY, INCLUDING CHERENKOV DETECTORS AND COUNTERS. J. E.

Terry. 1953. 12p. (AERE-Inf/Bib-90)

This bibliography has been compiled from abstract journals, A.E.R.E. Subject Indexes, and references in articles. Where the reference was found in Nuclear Science Abstracts (NSA) or Science Abstracts, Section A, this is indicated in square brackets after the reference. Where possible, references have been checked with the original few references in the literature to Russian work have been omitted where the original is particularly difficult to obtain in this country. The spelling CHERENKOV has been adopted throughout in accordance with the methods of transliteration of Russian now generally adopted in this country. (auth)

5814

Brookhaven National Lab.

TECHNICAL DISCUSSION OF BROOKHAVEN OFF-SITE PERSONNEL MONITORING SERVICE. F. P. Cowan. July 31, 1953. 9p. (BNL-1548)

The personnel neutron monitoring badge in use at BNL is described. Calibration of the Eastman NTA film used for neutron monitoring and of a Dupont packet containing a sensitive and an insensitive film for β-γ monitoring is discussed. Statistical considerations applicable to the nuclear track method of neutron monitoring are presented. An explanation of the weekly exposure report and interpretation of both neutron exposure and β-γ exposure data are included. (C.H.)

5815

Radiation Physics Lab., National Bureau of Standards

RADIOLOGICAL INSTRUMENT CALIBRATION; QUARTERLY PROGRESS REPORT FOR THE QUARTER ENDING MARCH 31, 1953. Frank H. Day. [nd] 64p. (NBS-2594)

Evaluation studies of the following instruments are reported: an experimental model of the Jasper survey meter; Jordan survey meters, model Nos. AG-50 and AG-500; AN/PDR-32 radiacmeter; AN-PDR-40 radiacmeter; Admiral AN/PDR-27(C) and NICC Model 2610 survey meters; Tracerlab AN/PDR-TIB survey meter; Anton AN/PDR-32 survey meter; Chatham AN/PDR-17(XN-2) pocket dosimeter; Bendix 50-r and 500-r IM-91/UD dosimeters; Victoreen IM-9(C)/PD dosimeters; and reciprocity law tests on 120 Taplin liquid dosimeters. (For preceding period see NBS-2216.) (C.H.)

5816

Atomic Energy Project, Western Reserve Univ.

THE PERFORMANCE OF CLINICAL SCINTILLATION COUNTERS. W. J. MacIntyre, W. F. Wirth, and T. E. Fessler. Issued Aug. 17, 1953. 42p. (NYO-4018)

The design and performance of the scintillation counters now being used by this laboratory for clinical and physiological applications are discussed with regard to crystal, phototube, preamplifier, physical construction, and scaler requirements. Characteristic curves on the variations of the above parameters are shown, and practical counting efficiencies for various applications of these counters are considered. (auth)

5817

BUBBLE CHAMBER TRACKS OF PENETRATING COSMIC-RAY PARTICLES. Donald A. Glaser. Phys. Rev. 91, 762-3 (1953) Aug. 1.

Tracks of penetrating cosmic-ray particles passing through an ether-filled bubble chamber under 10 cm of Pb have been recorded by flash photography triggered by a two-fold verticle coincidence telescope. Several characteristics of bubble chambers and their possible applications to high-energy nuclear physics are inferred. In order to estimate the conditions under which a bubble chamber will be useful as a detector of ionizing radiation, an approximate theory of the stability of charged bubbles in superheated liquids has been developed. (L.T.W.)

5818

FIVE NEW PHOTOMULTIPLIERS FOR SCINTILLATION COUNTING. Bernard R. Linden. Nucleonics 11, No. 9, 30-3(1953) Sept.

Photomultiplier tubes having front ends varying from 0.75 to 5 in., with new dynode structures and photosensitivities of 40 to 80 μa/lumen are described. Operating and dynamic characteristics of the tubes are given. (auth)

5819

OBTAINING INCREASED γ-SENSITIVITY IN AN END-WINDOW GEIGER TUBE. Frank E. Hoecker and Paul N. Wilkinson. Nucleonics 11, No. 9, 64-6(1953) Sept.

A modification of an end-window Geiger tube for use in medical diagnosis is described, in which the shield weight is reduced and sensitivity is increased. (E.S.)

5820

SCINTILLATIONS PRODUCED BY ALPHA PARTICLES IN CsI. Beat Hahn. Phys. Rev. 91, 772-3(1953) Aug. 1.

The surface of a CsI crystal was irradiated with collimated α particles. The pulse spectrum, which corresponds to the Po α line, is shown. The energy response of CsI crystals to α particles was investigated. (A more complete treatment of this material appears in French in Helv. Phys. Acta 26, 271-80(1953)). (L.T.W.)

5821

FLUORESCENT LIGHT YIELDS WITH ALPHA, BETA, AND GAMMA RADIATIONS. Milton Furst and Hartmut Kallmann. Phys. Rev. 91, 766-7(1953) Aug. 1.

Since it has frequently been contended that traces of impurities influence fluorescent yield considerably, new measurements of relative efficiencies with pure materials have been made. The materials investigated were anthracene crystal, anthracene powder, Ca tungstate, diphenyl, Radelin, terphenyl in phenylcyclohexane, and ZnS. (L.T.W.)

MESONS

5822

Brookhaven National Lab.

THE INTERACTION CROSS-SECTION OF HYDROGEN AND HEAVIER ELEMENTS FOR 450 MEV. NEGATIVE PIONS. S. J. Lindenbaum and Luke C. L. Yuan. [1953] 5p. (BNL-1535)

Values of the total interaction cross sections of H, C, and Cu for 450-Mev π^- mesons are reported to be 25 ± 3, 186 ± 22, and 730 ± 109 mb, respectively. The average cross section per nucleon for C and Cu is given as 26 ± 4 and 25 ± 5 mb. Experimental procedures are outlined. (K.S.)

5823

Brookhaven National Lab.

INTERACTIONS OF 500-MEV NEGATIVE π^- MESONS WITH EMULSION NUCLEI. M. Blau, M. Caulton, and J. E. Smith. [1952] 8p. (BNL-1553)

Results of exposing nuclear emulsions to a 500-Mev π^- beam are reported. In 38 ± 3% of the interactions, at least one meson left the nucleus. The data from 85 emitted mesons indicated no relation between energy and angle of emission. Several cases have been found for which elastic and inelastic scattering on greater nucleon complexes are probable. It is estimated that charge exchange took place in 15 to 20% of all interactions. Three elastic meson interactions with H nuclei have been identified with scattering angles of 72, 78, and 87° in the CM system. (K.S.)

5824

Brookhaven National Lab.

THE INTERACTION CROSS-SECTION OF HYDROGEN FOR 340 MEV POSITIVE PIONS. Luke C. L. Yuan and S. J. Lindenbaum. [1953]. 5p. (BNL-1556)

The value of the total interaction cross section of H for 340-Mev π^+ mesons is reported to be 48 ± 9 mb. (J.S.R.)

5825
Brookhaven National Lab.
MESON PRODUCTION BY 500-MEV NEGATIVE PIONS. M. Blau, M. Caulton, and J. E. Smith. [1952] 9p. (BNL-1558)

Six two-meson production events have been observed in nuclear plates bombarded by 500-Mev negative pions from the Cosmotron. Possible meson-meson production mechanisms and identification of the product mesons are discussed. It is considered probable that the meson creation is due to direct meson-nucleon collision. (K.S.)

5826
Rochester Univ.
POSITIVE PI MESON INTERACTIONS IN BERYLLIUM. F. H. Tenney and J. Tinlot. Aug. 13, 1953. 18p. (NYO-3709)

A 10-in. diam. magnet cloud chamber, containing a ¼-in. Be plate, has been operated in both the 40- and 50-Mev π^+ meson beams of the Rochester 130-in. cyclotron. Meson interactions in Be were obtained for three bands of energy: 15 to 30 Mev, 25 to 40 Mev, and 35 to 50 Mev. The events recorded as nuclear interactions were stars, stops, and scatterings of greater than 30°. From a survey of some 22,700 g/cm^2 of Be traversed, a total of 159 such events were found. Analysis of the data from each energy band indicates the absorption cross section to be energy-dependent. The ratio of corrected stars to corrected scatterings was found to be roughly 2:1. (auth)

5827
Radiation Lab., Univ. of Calif., Berkeley
AN ALTERNATE INTERPRETATION OF THE RESULTS ON THE μ-MESON DECAY ELECTRON SPECTRUM. Ryokichi Sagane. July 1953. 6p. (UCRL-2275)

A new interpretation is given to the results of an earlier experiment on the μ-meson decay spectrum (UCRL-1261) based on a revised value for the μ-meson mass. Experiments are being made to improve resolution. (K.S.)

5828
Radiation Lab., Univ. of Calif., Berkeley
THE DEPENDENCE OF THE 33 MEV π^+ PRODUCTION CROSS SECTION ON ATOMIC NUMBER. Ryokichi Sagane and Walter Dudziak. July 22, 1953. 6p. (UCRL-2284)

Results of a determination of the relative π^+ production cross sections (relative yield) of 33-Mev pions for Be, C, Al, Cu, Ag, and Pb are reported. It is shown that a best fit to experimental points is achieved by a $Z^{5/3}$ dependence of atomic number on the relative production cross sections. (K.S.)

5829
KINETIC ENERGIES OF V_1^0 PARTICLES. J. Ballam, D. R. Harris, A. L. Hodson, R. Ronald Rau, George T. Reynolds, S. B. Treiman, and M. Vidale. Phys. Rev. 91, 1019-20 (1953) Aug. 15.

In the period Nov. 1 to Dec. 11, 1952, 77 V^0 events have been obtained in a cloud chamber operated at the Interuniversity High Altitude Lab. at Echo Lake, Colo. (elevation 10,600 ft). The remarkably large fraction of the observed V^0 particles having low kinetic energies is commented upon, and particulars of two V^0 events which do not fit recently proposed decay schemes are given. (L.T.W.)

5830
PHOTOPRODUCTION OF MESONS IN ATOMIC NUCLEI. W. Thirring. Helv. Phys. Acta 26, 435(1953) June 15. (In German)

The production of mesons in atomic nuclei is reduced by the following effects. (1) Many end-states of the nucleon are forbidden by the Pauli principle. (2) Through the movement of the nucleon, the photon undergoes a Doppler displacement, so that many energetic nucleons are not in the position to produce mesons. (3) The meson can be reabsorbed in the nucleus. In light nuclei, effects 1 and 2 dominate, whereas in heavy nuclei, reabsorption occurs. (J.S.R.)

MOLECULAR PROPERTIES

5831
Brookhaven National Lab.
THE NUCLEAR QUADRUPOLE COUPLING IN THE Li_2 MOLECULE. R. M. Sternheimer and H. M. Foley. Brookhaven National Lab. and Columbia Univ. [1953]. 32p. (BNL-1546)

The effect of the quadrupole moment induced in the 1s shell on the nuclear quadrupole coupling q in the Li_2 molecule has been investigated for several wave functions. For the most accurate variational wave function of James, the inclusion of the induced moment gives $q/2e = -0.00106a_H^{-3}$. This result, together with the quadrupole coupling $qQ = +0.060$ Mc/sec for Li^7 leads to a negative value of the quadrupole moment $Q(Li^7)$; however, the value of q is so close to zero that the magnitude and even the sign of Q is uncertain. The value of 1/q which determines Q is very sensitive to changes in the molecular wave function, and it is shown that a small modification of the James wave function would lead to a negative $Q(Li^7)$ which agrees in order of magnitude with the prediction of the nuclear shell model. Calculations of q were also carried out for the Heitler-London and Coulson-Duncanson wave functions for the Li_2 molecule. (auth)

5832
Ames Lab.
RELATION BETWEEN BOND LENGTH AND STRETCHING FREQUENCY FOR THE CARBONYL GROUP. M. Margoshes, F. Fillwalk, V. A. Fassel, and R. E. Rundle. [Aug. 28, 1953] 6p. (ISC-398)

On the assumption that the vibration involves only motion of the C and O atoms relative to each other, with no other motion of the molecule, the bond lengths of a group of carbonyl compounds were graphed against the stretching frequency. The bond lengths ranged from 1.13 to 1.31 A, and the average distance of the points from the smooth curve was 0.013 A. (J.S.R.)

NEUTRONS

5833
Knolls Atomic Power Lab.
AREA ANALYSIS FOR SELF-INDICATION DATA. J. P. Simpelaar. Aug. 17, 1953. 19p. (KAPL-957)

Solutions for the general expression of the self-indication cross section have been obtained in terms of confluent hypergeometric functions. These solutions have been calculated with the target-to-absorber thickness ratio T as a parameter. Solutions are also presented for limiting cases and for finite limits of integration. (auth)

5834
POLARIZATION OF THE (d,d) NEUTRON AND SPIN ORBITAL COUPLING IN C^{12}. R. Ricamo. Helv. Phys. Acta 26, 423-4(1953) June 15. (In German)

The polarization and spin orbital coupling of neutrons from the (d,d) reaction in C^{12} have been measured for neutron energies of 3.50 and 3.32 Mev. (J.S.R.)

5835
DETECTION OF POLARIZED NEUTRONS FROM THE (d,d) REACTION. P. Huber and E. Baumgartner. Helv. Phys. Acta 26, 420-2(1953) June 15. (In German) (cf. NSA 7-927)

The ratio of the radiation intensity to the radiation azimuth was measured for a polarization degree of 20%.

It was determined that the degree of polarization is dependent on the energy of the incident deuteron. (J.S.R.)

NUCLEAR PHYSICS

5836

Brookhaven National Lab.

A HYPOTHESIS CONCERNING THE RELATIONS AMONG THE "NEW UNSTABLE PARTICLES." M. Goldhaber. Aug. 13, 1953. 9p. (BNL-1551)

An attempt is made to systematize the present knowledge of the phenomena concerned with production, absorption, and decay of the "new unstable particles" in terms of only one of these particles and its "compounds" with nucleons and π mesons. (auth)

5837

Brookhaven National Lab.

MIXED CONFIGURATIONS IN NUCLEI. A. De-Shalit, Laboratory for Nuclear Science, Mass. Inst. of Tech. and M. Goldhaber, Brookhaven National Lab. [Aug. 11, 1953] 25p. (BNL-1554)

The role of mixed configurations in nuclear states is discussed and illustrated by various examples; it is discussed in particular for β transitions with anomalous ft-value and as a qualitative explanation of the empirically found smooth variations of the first excited states of even-even nuclei. It is shown by various examples that a nucleon of one kind (neutron or proton) with a given j has a "stabilizing" influence on pairs of the other kind with a given j'. This stabilization effect is calculated on simplified assumptions for different j and j'. (auth)

5838

Los Alamos Scientific Lab.

THE DETERMINATION OF NUCLEAR TEMPERATURES BY MEANS OF THE EVAPORATION MODEL. Louis Rosen and Leona Stewart. June 1953. 10p. (LA-1560)

Recently published data on the energy distribution of (n,n) and (n,2n) neutrons, resulting from the irradiation of various elements by 14-Mev neutrons, have been used to evaluate the constant in the exponential of the Maxwellian which describes the distribution in energy of first emitted neutrons. For each element, the total cross section for the emission of neutrons is compared with the experimental value for the sum of the inelastic and (n,2n) cross sections. (auth)

5839

THE THEORY OF FORMATION OF PAIRS BY IMPACT WITH HEAVY PARTICLES. L. B. Okun. Doklady Akad. Nauk S.S.S.R. 89, 833-5(1953) Apr. 11. (In Russian)

The formation of electron-positron pairs by the non-relativistic impact of heavy particles on atoms has been investigated. Two formulas have been developed. If the adiabatic parameter $\delta \gg 1$, then the cross section for formation of pairs is $\sigma = (16/27\pi)\sigma_0 \ln^3\delta$. If $\delta \ll 1$, then $\sigma = (8\ln 2/9\pi\sqrt{3})\sigma_0\delta e^{-4\pi/\delta}$. (J.S.R.)

NUCLEAR PROPERTIES

5840

Radiation Lab., Univ. of Calif., Berkeley

NEUTRON TOTAL CROSS SECTION FOR BISMUTH AND URANIUM BETWEEN 45 AND 160 MEV. W. I. Linlor and B. Ragent. Aug. 5, 1953. Decl. Aug. 24, 1953. 5p. (AECD-3546; UCRL-2294)

Neutron total cross sections for Bi and U have been measured in a good-geometry transmission experiment, using a time-of-flight instrumentation. The source of neutrons was the stripped deuteron beam of the 184-in. synchrocyclotron. The results are presented graphically. (J.A.G.)

5841

Neutron Cross Section Advisory Group, AEC

NEUTRON CROSS SECTION COMPILATION; SUPPLEMENT 2. Brookhaven Neutron Cross Section Compilation Group. June 15, 1953. 54p. (AECU-2040(suppl. 2))

Data from recent work on neutron cross sections have been evaluated and tabulated. Where no previous values were known, the new values have been listed as new data. In the cases where values were given in the original compilation, the new data have been evaluated with the old and have been designated in the table. When no significant change resulted from the consideration of these new data, a new value has not been listed. A few accurate absorption and activation cross sections, which were measured relative to B or Au, have been normalized to the best values of B and Au. Re-evaluations of the old data warrant changes in the cross section; these have been so labeled. Forty-two cross-section curves are included for replacement or revision of the corresponding ones in supplement 1 to AECU-2040. (J.A.G.)

5842

Brookhaven National Lab.

PARAMAGNETIC RESONANCE HYPERFINE STRUCTURE OF V^{50} AND V^{51}. C. Kikuchi, M. H. Sirvetz, and V. W. Cohen. [1953] 19p. (BNL-1480)

The paramagnetic resonance of a magnetically dilute crystal of V Tutton salt containing 23% of the isotope V^{50} has been observed. The hfs of V^{50} was completely resolved, and its spin is I = 6. The ratio of the nuclear g-factors, $g(V^{50})/g(V^{51})$, was measured with the result, 0.3792 ± 0.0008, in good agreement with the value determined directly by nuclear magnetic-resonance experiments. (auth)

5843

Brookhaven National Lab.

THE DECAY SCHEME OF Ag^{108}. M. L. Perlman, W. Bernstein, and R. B. Schwartz. [1953] 18p. (BNL-1532)

The radiations of 2.3-minute Ag^{108} have been examined with scintillation and proportional counter spectrometers and with a coincidence spectrometer. The transitions and their abundances were found to be as follows: β^- 1.8 Mev (97.3%); β^- 1.17 Mev accompanied by γ of energy 0.63 Mev (0.8%); β^+ (0.14%); and K-capture to ground and excited states of Pd^{108} (1.6%). Gamma rays of energies 0.61 Mev and 0.43 Mev were found to accompany K-capture; the abundances of the different capture transitions were measured. Spin and parity assignments were made. (auth)

5844

Brookhaven National Lab.

SLOW NEUTRON RESONANCES IN TANTALUM. R. L. Christensen. [Sept. 1, 1953] 8p. (BNL-1557)

A crystal spectrometer has been used to investigate the total neutron cross section in Ta in the region 0.3 to 50 ev. Resonances were detected at 4.29, 10.36, 13.9, 20.7, 24.2, 36.7, and 39.4 ev. The fact that the strengths of these resonances vary by a factor of about 35 is attributed to a large variation in neutron width. The level spacing in this odd-even monoisotopic element has been estimated as 6 ev. (auth)

5845

Brookhaven National Lab.

THE NUCLEAR MAGNETIC MOMENT OF S^{35} BY MICROWAVE SPECTROSCOPY. Bernard F. Burke and M. W. P. Strandberg, Massachusetts Inst. of Tech. and Victor W. Cohen, Brookhaven National Lab. and Walter S. Koski, Johns Hopkins Univ. [1952] 8p. (BNL-1561)

The nuclear magnetic moment of S^{35} has been measured by the Zeeman effect in the microwave spectrum of OCS yielding a value of 1.00 ± 0.04 n.m. A value of the electric

quadrupole coupling constant in OCS is found to be 21.90 ± 0.04. Mc/sec. (auth)

5846
Brookhaven National Lab.
THE TOTAL π^--p CROSS SECTION AT 840 AND 470 MEV. A. M. Shapiro, C. P. Leavitt, and F. F. Chen. [nd] 6p. (BNL-1567)

The total π^- cross sections for a C and polyethylene absorber are reported as 27 ± 5 mb and 47 ± 5 mb for respective incident pion energies of 470 and 840 Mev. Correlation of these data with other measurements leads to the prediction of a peak near 900 Mev. (cf. BNL-1535.) (K.S.)

5847
TOTAL CROSS SECTIONS OF 408-MEV PROTONS FOR HYDROGEN AND LIGHT ELEMENTS. J. Marshall, L. Marshall, and A. V. Nedzel. Phys. Rev. 91, 767-8(1953) Aug. 1.

The total cross sections of several light elements for 408-Mev protons have been measured by a transmission method and include all processes except coulomb scattering. The values obtained are as follows:

$\sigma(H) = 24.0 \pm 1$ mb (liquid H)
$\sigma(Li) = 194 \pm 8$ mb (Li metal)
$\sigma(Be) = 242 \pm 6$ mb (Be metal)
$\sigma(C) = 285 \pm 14$ mb (graphite)
$\sigma(D\text{-}H) = \frac{1}{2}[\sigma(D_2O) - \sigma(H_2O)] = 31.6 \pm 2$ mb
$\sigma(O) = \sigma(H_2O) - 2\sigma(H) = 406 \pm 3$ mb
$\sigma(D) = \sigma(D\text{-}H) \pm \sigma(H) = 55.6 \pm 2.2$ mb. (L.T.W.)

5848
CONSERVATION OF THE ISOTOPIC SPIN. I. AN APPLICATION IN THE CLASSIFICATION OF LEVELS IN LIGHT NUCLEI. P. M. Endt. Ned. Tijdschr. Natuurk. 19, 177-80 (1953) Aug. (In Dutch)

The energy levels and spin of O^{14}, C^{14}, and N^{14} are compared. The ground state of O^{14} and C^{14} and the 2.32-Mev level of N^{14} form a triplet with spin T = 1. The energy level schemes of C^{10}, B^{10}, and Be^{10} and of Li^6 and He^6 are also compared. (J.S.R.)

5849
CONSERVATION OF THE ISOTOPIC SPIN. II. SYMMETRY OF THE NUCLEAR ENERGY AS APPLIED TO MESON REACTIONS. S. A. Wouthuysen. Ned. Tijdschr. Natuurk. 19, 181-6(1953) Aug. (In Dutch)

The formation of mesons from the reactions p + p, n + p, and n + n are discussed. The spins of the interacting particles determine the type of π meson produced. A relationship is found between the reaction cross section and the meson formed. (J.S.R.)

5850
A METASTABLE STATE OF V^{52}. T. Wiedling. Phys. Rev. 91, 767(1953) Aug. 1.

Spectroscopically pure V_2O_5 was irradiated, and the 16-hr half life was verified. In order to identify the 16-hr activity, the γ spectrum was measured. Two γ rays with energies of 59 and 96 kev were obtained. These two low-energy lines probably belong to excited states of V^{52}, the higher level of which has a half life of 16 hr and the lower one 3.7 min. A tentative decay scheme of V^{52} is presented. (L.T.W.)

5851
THE 0^+-0^+ TRANSFORMATION OF THE 1.45-SEC Cl^{34}. W. Arber and P. Stähelin. Helv. Phys. Acta 26, 433-4 (1953) June 15. (In German)

The transformation of 0 spin and equal parity of 1.45-sec Cl^{34} to S^{34} is discussed. This β transformation with a ft value 2650 is "super-allowed." This transition shows the most direct proof of a Fermi resonance. (J.S.R.)

5852
DETERMINATION OF THE ELECTRIC QUADRUPOLE MOMENTS OF AN EXCITED NUCLEUS (Cd^{111}, 247 KEV). H. Albers-Schönberg, E. Herr, T. B. Novey, R. Rüetschi, and P. Scherrer. Helv. Phys. Acta 26, 425-6(1953) June 15. (In German)

The reciprocal action of the nuclear moment with other electromagnetic fields was determined to be 12 Mc for Cd^{111} single crystals. The electric quadrupole moment can be determined from this value as soon as the value of degree in the In lattice is known. (J.S.R.)

5853
THE MAGNETIC NUCLEAR MOMENT OF Cr^{53}. F. Alder and K. Halbach. Helv. Phys. Acta 26, 426-7(1953) June 15. (In German)

The nuclear magnetic moment of Cr^{53}, determined from the resonance frequency of Cr^{53} and N^{14} in Na_2CrO_4 and HNO_3, is 0.47351 ± 0.00006. (J.S.R.)

NUCLEAR REACTORS

5854
Oak Ridge National Lab.
THE ECONOMICS OF POWER REACTOR PROCESSING. D. E. Ferguson. [July 1953] 14p. (AECD-3550; CF-53-7-46)

The economics of chemical processing for a breeder-type reactor intended primarily for power production is discussed. The purpose of chemical processing is to enable the reactor to produce power as economically as possible. In general, the chemical process must remove the fission products which lower the efficiency of reactor operation and reclaim unspent fuel and source material. The costs that vary with the frequency of processing may be optimized, and the cost of processing per kilowatt of electricity produced may be expressed in terms of several variables. These variables include the value of fissionable material as fuel, the unit cost of chemical processing, and the fraction of material lost during processing. An evaluation of the effect of these variables on the cost of atomic power is presented. (auth)

5855
Phillips Petroleum Co., Atomic Energy Div.
THE MATERIALS TESTING REACTOR. L. J. Weber. Sept. 24, 1952. Decl. with deletions Aug. 24, 1953. 14p. (AECD-3552; IDO-16032)

This report is a descriptive discussion of the design facilities and operation of the Materials Testing Reactor. (K.S.)

5856
Oak Ridge National Lab.
A LOW COST EXPERIMENTAL NEUTRON CHAIN REACTOR. PART 2. Fred H. Abernathy, Lawrence G. Barrett, William A. Berger, John A. Dever, John F. Maurer, Russell B. Mesler, and Paul J. Sykes, Jr. Aug. 20, 1952. Decl. with deletions Aug. 6, 1953. 254p. (AECD-3557; CF-52-11-125)

Design of an experimental reactor facility is described, the outstanding features of which are reliability, versatility, simplicity, and over-all low cost. In essence, the reactor consists of a number of fuel elements suspended in a pool of water. The active core is reflected, moderated, cooled, and shielded by the pool water. The reactor is designed to operate at one Mw total power under forced circulation of the water through the core. The average thermal flux available for experimental purposes at this power level is estimated to be 1.2×10^{13} neutrons/cm^2/sec. The reactor can be operated at a power level of 100 kw employing only natural convective cooling in the core. The total cost of the entire reactor facility including an adequate building to

house it, controls and instrumentation, heat exchanger and associated equipment, and fuel elements exclusive of the enriched U, has been estimated to be $271,000.00. (auth)

5857
Brookhaven National Lab.
THE INSTRUMENTATION OF THE BROOKHAVEN REACTOR. J. E. Binns. [nd] 9p. (BNL-1516)

A descriptive account of the startup, operation, and shutdown of the Brookhaven reactor is given, with emphasis on reactor response and neutron kinetics as a function of control-rod position. Neutron counting at various levels is treated. (K.S.)

5858
Los Alamos Scientific Lab.
COMPOSITION AND DECOMPOSITION OF RESIDUAL WATER-BOILER OFF-GAS. Harold M. Busey. March 1953. 10p. (LA-1521)

The composition of the gas vented from the Los Alamos Water Boiler has been determined. Measurements were made of the rate of decay of this mixture over a long period, and the effects of various shields were observed. Separation of the radioactive gases from the mixture was made by adsorption on activated charcoal, and a high decontamination factor was achieved for a 6-hr test on the total gas stream. Possible disposal methods are discussed. (auth)

5859
GAS RECOMBINATION SYSTEM FOR A HOMOGENEOUS REACTOR. L. D. P. King, R. P. Hammond, J. A. Leary, M. E. Bunker, and W. R. Wykoff. Nucleonics 11, No. 9, 25-9(1953) Sept.

Dissociation of the fuel-carrying moderator in the Los Alamos Water Boiler is one of the factors limiting it to low-power operation. A gas recombination system is described which has operated satisfactorily at powers up to 35 kev for 2 yr (80,000 kwh). In this time no detectable change has occurred in the catalyst bed. (auth)

NUCLEAR TRANSFORMATION

5860
Brookhaven National Lab.
SCINTILLATION SPECTROMETER DETERMINATION OF L CAPTURE TO K CAPTURE RATIO IN Cd^{109} AND I^{125}. E. der Mateosian. [1953] 12p. (BNL-1531)

A useful technique of scintillation spectrometry developed at BNL, that of growing crystals containing radioactive nuclei, was employed to measure the L-capture to K-capture ratio in the orbital electron capture occurring in Cd^{109} and I^{125}. Marshak's formulas were used to calculate the energy of the transition. The L-capture to K-capture ratio and the energy of the transition are reported as 0.28 ± 0.03 and 73^{+12}_{-6} kev for Cd^{109} and 0.23 ± 0.03 and 108^{+20}_{-10} kev for I^{125}, respectively. (auth)

5861
Oak Ridge National Lab.
THE (n,γ) CROSS SECTION FOR Na^{23} AT 500-600 KEV. F. H. Abernathy, Oak Ridge National Lab. and H. Reese, Jr., Curtiss-Wright Corp. Aug. 4, 1953. 2p. (CF-53-8-22)

The (n,γ) cross section for Na^{23} has been measured at one energy using the ORNL 5-Mev Van de Graaff and was found to be 0.26 ± 0.05 mb for neutrons of 500 to 600 kev. (J.A.G.)

5862
PHOTO REACTIONS OF B^{10} AND B^{11} WITH γ RADIATION UP TO 31 MEV. P. Erdös, P. Scherrer, and P. Stoll. Helv. Phys. Acta 26, 207-40(1953) June 15. (In German)

Photographic plates, loaded with B have been exposed to γ rays up to 31 Mev. Events corresponding to the following reactions were observed and their cross sections determined: $B^{11}(\gamma,t)Be^8$, $B^{10}(\gamma,\alpha)Be^6$, $B^{10}(\gamma,np)2He^4$, $B^{11}(\gamma,\alpha)Li^7$, and $B^{10}(\gamma,\alpha)Li^6$. The mechanisms of these reactions were thoroughly discussed. Three new energy levels of the Be^8 nucleus have been found (all these levels have even angular momentum and even parity): 2.2; 3.4; 6.8 Mev. All these levels of the Be^8 nucleus can be explained by a modification of the α model, proposed by Inglis. The simple decay scheme of the (γ,α) reaction on B^{10} permits conclusions on the character of absorption of the γ radiation, respecting the selection rules. (auth)

5863
THE ENERGY DISTRIBUTION AND ANGULAR DISTRIBUTION OF ALPHA PARTICLES FROM THE PROCESS $B^{11}(p,\alpha)Be^8$. H. Glättli and P. Stoll. Helv. Phys. Acta 26, 428-30(1953) June 15. (In German)

The energies of the excited Be^8 nucleus were compared with the α models of Wheeler and Inglis. An expression for the determination of the angular distribution is given. (J.S.R.)

PARTICLE ACCELERATORS

5864
Laboratory for Nuclear Science, Mass. Inst. of Tech.
DESIGN STUDY FOR A 15-BEV ACCELERATOR. June 30, 1953. 220p. (BNL-1544; Technical Report 60)

Design of a 15-bev proton synchrotron is given in detail. Basic design concepts and projected requirements to be met by the magnet, r-f system, vacuum system, and controls are discussed. Additional information is provided on injection techniques, alignment and tune-up procedures, theory of operation, building design, personnel requirements, and cost estimates. (K.S.)

RADIATION ABSORPTION AND SCATTERING

5865
Brookhaven National Lab.
MAGNETIC INELASTIC SCATTERING OF SLOW NEUTRONS. H. Palevsky and D. J. Hughes. [1952] 6p. (BNL-1536)

The theory of the inelastic scattering of very slow neutrons, derived on the assumption of an incoherent approximation, has been experimentally verified for Al, Be, and Cu. (Palevsky and Smith, Phys. Rev. 86, 604(1952)). For the case of Fe, however, such scattering is in excess of that predicted by theory. Experiments showed a marked change in the slope of increasing scattering as a function of temperature at the Curie point. It is concluded that this excess scattering is largely due to magnetic inelastic effects. (K.S.)

5866
Brookhaven National Lab.
DEGRADATION OF GAMMA RAYS IN WATER. M. M. Weiss and W. Bernstein. [1953] 9p. (BNL-1541)

The attenuation spectrum of Co^{60} γ radiation in water was calculated for the region below 0.1 Mev and above 1 Mev as a function of distance. A description of the scintillation spectrometer used is included. Measurements were taken in a water tank with both the source and the detector located at least 3 ft from a boundary. Several sources were used to cover the desired intensity range and were normalized at overlapping points. Low-energy spectra were obtained for distances of 70 to 190 cm from the Co^{60} source at 10-cm intervals. Data are presented in the form of curves, and comparison is made with data for 0.275-Mev Hg^{203} γ radiation. (C.H.)

5867
Brookhaven National Lab.
π^+-p SCATTERING NEAR 260 MEV. W. B. Fowler, R. M. Lea, W. D. Shephard, R. P. Shutt, A. M. Thorndike, and W. L. Whittemore. [1953] 5p. (BNL-1569)

Proton-pion elastic scattering events with scattering angles <5° have been recorded in a H-filled diffusion cloud

chamber. The resulting cross section was 150 ± 18 mb. From the shape of the π-μ distribution spectrum, it was inferred that the average energy of the pions was 260 Mev. Experimental results point to the possibility of a d-wave scattering component. (K.S.)

5868

Ames Lab.

ORBITAL ELECTRON EJECTION IN LARGE-ANGLE SCATTERING. Marvin E. Ebel and J. K. Knipp. [June 1952] 29p. (ISC-307)

The probability of an orbital electron being ejected when the incident particle is scattered through a large angle is computed on the basis of quantum mechanics by means of a second-order perturbation technique. This computation assumes that only coulomb forces act between the particles and that collisions in which an electron scatters the incident particle through a large angle are of negligible frequency. The final energy of the ejected electron is considered to be sufficiently large so that its state may be represented by a plane wave. Momentum wave functions bearing a close resemblance to the Slater functions are used to describe the atom. A probability distribution of the ejected electrons is obtained. The distribution is found to be approximately spherically symmetrical, but it has strong dependence on the electron energy, the over-all probability decreasing essentially as the seven-halves power of the energy. The results of this calculation are compared with the classical formula for the probability of production of δ rays by a particle passing through matter. It is found that the quantum-mechanical calculation gives results in substantial agreement with those obtained by classical considerations if the high density of electrons around the nucleus (near to which the incident particle must strike if it is to be scattered through a large angle) is included in applying the δ-ray formula. Both the classical and quantum formulas give a probability for ejection of the same order. (auth)

5869

Case Inst. of Tech.

ENERGY LOSS AND SCATTERING OF .624 MEV ELECTRONS IN METALLIC FOILS. Arthur Lindener. [1952] 23p. (NP-4764; Technical Report 20)

Some experimental results for the value of the most probable energy loss of Ba^{137} 0.624 Mev electrons in Al foils 10 to 70 mg/cm^2 thick are compared with Landau's theoretical expression. The discrepancy is such that the Landau expression renders values ~10 to 15% below those obtained by experiment. Data on angular distribution are also included in order to illustrate scattering in the target. (auth)

5870

Rochester Univ.

DOUBLE SCATTERING OF HIGH ENERGY PROTONS. C. L. Oxley, W. F. Cartwright, and J. Rouvina. Aug. 18, 1953. 38p. (NYO-3830)

Measurements of polarization effects in double scattering of protons have been made in the energy range near 200 Mev. With a first scattering angle of 19° and a mean second polar angle of 27°, the azimuthal asymmetry 2, the fractional difference between flux at azimuths 0 and 180°, has been determined with several first and second target materials. With polyethylene second target, an effective H target was realized by detecting in coincidence the scattered and recoil protons. By successive use of C and polyethylene first targets with an effective C second target, the polarizations produced in single scatters from H and C were found. A comparison of the p-p asymmetry with those calculated by Goldfarb and Feldman using current p-p force models shows that the repulsive-core model of Jastrow which best predicts the observed single-scattering differential cross sections yields far too little polarization. Considerable singular noncentral force as used in other models seems indicated. The polarizations in scattering from several elements in the range from D to Cu, as measured with H analyzer, vary from 20 to 50%. (See NSA 7-4671) (auth)

5871

Palmer Physical Lab., Princeton Univ.

POSITRON-ELECTRON DIFFERENCES IN ENERGY LOSS AND MULTIPLE SCATTERING. F. Rohrlich and B. C. Carlson. May 28, 1953. 24p. (NYO-6177)

The Bhabha cross section for positron-electron scattering is used to derive the average rate of collision loss by positrons passing through matter, which differs from the corresponding expression for negative electrons by a few per cent. The spin and exchange terms of the Bhabha and Møller cross sections produce small corrections also in the Landau distribution of energy losses by positive and negative electrons in thin foils, the most probable energy loss being less affected than the shape of the distribution. Positron-electron differences in the average cosine of the multiple-scattering angle, and in the penetration depth at which the particles have lost their memory of initial direction, are calculated from the appropriate elastic cross sections; the difference in rate of energy loss is included in the calculation. Numerical examples for Al and Pb are given. (auth)

5872

Oak Ridge National Lab.

TRACK WIDTH OF A HEAVY CHARGED PARTICLE. Jacob Neufeld and Walter S. Snyder. Issued Aug. 28, 1953. 18p. (ORNL-1594)

The energy loss of a heavy charged particle moving through tissue was calculated as a function of distance from the track of the particle. The calculation includes the energy-loss density as well as the cumulative distribution of these losses. The curves presented serve to give a fairly detailed picture of the intensity of the disturbance due to the passage of the charged particles. Data are also included on the amount of H, C, N, and O in tissue and the electron and energy loss due to free collisions with these elements. (C.H.)

5873

Radiation Lab., Univ. of Calif., Berkeley

STOPPING POWER AND ION DENSITY. Edward Vaughan. July 24, 1953. 21p. (UCRL-2287)

Stopping power, ionization, and range-energy relations are treated for heavy particles such as protons, deuterons, α particles, and mesons. Basic theory and the results of several approximations compare favorably with experiment. Straggling and scattering considerations are briefly treated. (K.S.)

5874

GAMMA-RAY ATTENUATION. PART II. ANALYSIS OF PENETRATION. U. Fano. Nucleonics 11, No. 9, 55-61 (1953) Sept.

Analysis of γ-ray penetration to determine attenuation coefficients and the use of published data in shielding calculations are described. (cf. Part I, Nucleonics 11, No. 8, 8-12(1953)) (auth)

5875

ESTIMATION OF SELF-ABSORPTION WITHIN A HOMOGENEOUS CYLINDRICAL SOURCE. Edwin L. Field. Nucleonics 11, No. 9, 66-8(1953) Sept.

A solution to the problem of estimating the amount of β or γ radiation absorbed within a homogeneous active cylinder is attempted, with the assumption that the length of the cylinder is long in comparison with its diameter and that the absorption of radiation within the cylinder obeys an exponential absorption equation. (E.S.)

5876
NEW EVIDENCE CONCERNING EXTREME ENERGY INTERACTIONS IN HEAVY NUCLEI. C. B. A. McCusker and F. C. Roesler. Phys. Rev. 91, 769-70(1953) Aug. 1.

Kaplon, Ritson, and Walker (Phys. Rev. 90, 716(1953)) investigated stars produced in Pb and emulsion by 10^{12} to 10^{13} ev primaries. In the present paper their results are discussed in terms of the theory of the extreme-energy cascade of Roester and McCusker (Nuovo cimento 10, 127 (1953)). (L.T.W.)

5877
GAMMA RADIATION FROM INELASTIC SCATTERING OF 2.7-MEV NEUTRONS. V. E. Scherrer, W. L. Smith, B. A. Allison, and W. R. Faust. Phys. Rev. 91, 768-9(1953) Aug. 1.

Preliminary observations of γ radiation arising from bombardment of Co, Cu, and Ag with 2.7-Mev protons are reported. The Ag pulse-height indicates γ rays at 1.1 and 1.5 Mev. The Cu spectrum shows γ rays at 0.88 Mev and a broad smear near 1.47 Mev. A strong 1.1-Mev γ ray was observed from Co. (L.T.W.)

5878
ANGULAR DISTRIBUTION OF SCATTERED NEUTRONS IN BERYLLIUM. R. Meier and R. Ricamo. Helv. Phys. Acta 26, 430-3(1953) June 15. (In German)

The angular distribution of neutrons scattered by Be were measured for 5 energy levels, 3.66, 3.32, 2.90, 2.60, and 2.30 Mev. A detailed description of the apparatus used is given. (J.S.R.)

RADIATION EFFECTS

5879
Brookhaven National Lab.
VARIABLE ACTIVATION ENERGY AND THE MOTION OF LATTICE DEFECTS. G. J. Dienes. [1953] 5p. (BNL-1510)

The isothermal annealing curves of irradiated Cu were analyzed on the basis of a variable activation energy. The log t vs. 1/T plot (where t = time and T = temperature) is unchanged by a variable activation energy if the number of lattice disturbances (n) is constant. A small variation of the activation energy with respect to n causes a large change in the time scale for the relaxation of n. (cf. NSA 7-1679) (J.S.R.)

5880
THERMOLUMINESCENCE OF QUARTZ AND FUSED QUARTZ COLORED BY X-RAY IRRADIATION. Ryosuke Yokota. Phys. Rev. 91, 1013-14(1953) Aug. 15.

Quartz and fused quartz were exposed to x rays at room temperature for 56 hr. Saturation of coloration takes place approximately after exposure for 56 hr. A comparison of the glow curves for the two samples shows that in quartz crystal there exist trapping centers having several trapping levels, but in fused quartz there exist some groups of trapping levels. Fused quartz has a disordered lattice but preserves to some extent the local color of the crystal. (L.T.W.)

RADIOACTIVITY

5881
Vanderbilt Univ.
THE ELECTRON-POSITRON SPECTRUM OF Zn^{65} ABOVE 5 KEV. J. F. Perkins and S. K. Haynes. July 24, 1953. 31p. (AECU-2670)

The momentum distributions of K Auger electrons, positrons, and conversion electrons of Zn^{65} have been measured in a magnetic-lens spectrometer with very thin sources and counter windows. The positron Fermi plot was found to be linear from the end-point of 325 ± 3 kev to ~50 kev. The positron decay is simple, contrary to some previously published results. From the observed intensities of K Auger electrons, positrons, and conversion electrons and values of capture branching ratio, fluorescence yield, and L-capture to K-capture ratios taken from the literature, the intensity ratios of the various spectral components have been obtained. The resulting conversion coefficient, $\alpha = (2.56 \pm 0.20) \times 10^{-4}$, agrees with other experimental determinations and strongly suggests an E2 transition. The observed ratio of K capture to the ground state to positrons, 28.0 ± 3.2, is in satisfactory agreement with the recently calculated theoretical value of 29.0 for an allowed transition. This agreement, in view of the high ft value, established the 1-forbidden character of the transition. (auth)

5882
Brookhaven National Lab.
THE DIRECTIONAL CORRELATION AND ELECTRIC QUADRUPOLE INTERACTION IN THE γ-γ CASCADE OF 48.7 MIN Cd^{111m}. J. J. Kraushaar and R. V. Pound. [Aug. 26, 1953] 7p. (BNL-1559)

The correlation in the directions of emission of the two successive γ rays of the 48.7-min isomer Cd^{111m} has been measured by use of several sources differing in chemical and physical state. One purpose was to test further the hypothesis that such correlations can be disturbed through the medium of the electric quadrupole moment of the nucleus in its intermediate state. Such effects have been observed by others in the γ-γ correlation of the Cd^{111} following K-capture in 2.8-day In^{111}. The use of the 48.7-min isomer allows full knowledge of the chemical and physical environments of the nucleus because no changes in electronic configuration and no important recoil energies are involved after the source has been prepared. (auth)

5883
Carnegie Inst. of Tech.
NUCLEAR CHEMISTRY RESEARCH PROGRESS REPORT FOR CONTRACT TERM 1952-3. Truman P. Kohman. May 31, 1953. 37p. (NYO-3621)

Progress is reported on the detection of natural radioactivities and improved methods for geological age determinations. Measurements have been made on the weak natural β activity of Ca^{48}, V^{50}, Zr^{96}, Mo^{100}, Sb^{123}, and Nd^{150}. Additional evidence has been obtained for the natural α activity of Pb^{204} and Nd^{144}. Studies on the induced radioactivities of Fe^{60}, Ti^{44}, and Ti^{52} indicate half lives greater than 10 to 1000 days. A 0.12-Mev γ activity has been found in 3.4-day Sc^{47}. Current research on Pb and C^{14} geochronometry is outlined. (K.S.)

RARE EARTHS AND RARE-EARTH COMPOUNDS

5884
Ames Lab.
THE HEAT CAPACITY OF GADOLINIUM FROM 15 TO 355°K. M. Griffel, R. E. Skochdopole, and F. H. Spedding. July 23, 1953. 16p. (ISC-367)

The heat capacity of Gd has been measured over the temperature range 15 to 355°K. An enhanced heat capacity associated with the ferromagnetic transition was observed, with maximum at 18.6°C. The thermodynamic functions were computed and are tabulated for various temperatures. The results are discussed in connection with theories of ferromagnetism. (auth)

5885
Radiation Lab., Univ. of Calif., Berkeley
ALPHA ACTIVITY OF Sm^{148} AS DETECTED WITH NUCLEAR EMULSIONS. Dean C. Dunlavey and Glenn T. Seaborg. July 15, 1953. 4p. (UCRL-2277)

Purified Nd of natural isotopic composition was bombarded with 40-Mev α particles. The Sm fraction was separated in an ion exchange column and impregnated into

nuclear plates after the decay of the 47-hr Sm^{153}. The α-particle tracks of the Sm^{148}, developed in the emulsion, had a mean energy of 2.55 ± 0.05. The half life is $\sim 5 \times 10^{7}$ years. (J.S.R.)

SPECTROSCOPY

5886

Norman Bridge Lab. of Physics, Calif. Inst. of Tech.

DIFFRACTION OF LONG WAVELENGTH X-RAYS; FUNDAMENTAL RESEARCH IN SPECTROSCOPY OF X-RAYS AND GAMMA-RAYS. Burton Henke. June 1953. 110p. (AECU-2638)

The theory and application of low-angle x-ray diffraction by long wavelengths are discussed. Four methods of obtaining the diffraction pattern are described; namely, the double-crystal spectrometer, the annular-slit system, the concave mica, point-focusing monochromator, and the total-reflection, point-focusing system. The design and construction of the total-reflection equipment is described in detail. This method is applied to the measurement of the Dow latex particles. (auth)

5887

INFRARED ABSORPTION SPECTRUM OF LIQUID WATER IN THE 3200 TO 3600 cm^{-1} REGION. S. N. Andreev. [Andreyev] and T. G. Balicheva. Translated from Doklady Akad. Nauk S.S.S.R. 90, 149-51(1953). 3p. (NSF-tr-66; D-90-149)

A study of the infrared absorption spectrum of water indicates a sharp intensity minimum at 3390 cm^{-1}. Fine structure has been observed in the wings of the absorption bands. The data are discussed in the light of current theories on the H-bonding mechanism. (K.S.)

THEORETICAL PHYSICS

5888

Ames Lab.

NON-LOCALIZABLE INTERACTIONS IN QUANTUM FIELD THEORY. Marvin E. Ebel. Aug. 1, 1953. 45p. (ISC-388)

An analysis is made of the proposal that some of the divergence difficulties encountered in the current theories of elementary particles may be removed by assuming a non-local interaction between the quantized fields representing the particles. It is assumed that the interaction-energy density is a function of field operators at three points, instead of just one, a form function being used to weight more heavily contributions from nearby points. The additional freedom provided by the introduction of the somewhat arbitrary form function is sufficient to permit making integrals previously divergent converge. It is shown that, for the most general form function, an energy-momentum tensor and a charge-current four-vector defined in the usual way will not satisfy a differential continuity equation; energy, momentum charge, and current are conserved only over the collision as a whole. As a result, a hamiltonian in the familiar form does not seem to exist, and it is necessary to find the S-matrix for the process directly from the equations of motion. A method of doing this is presented. Rules analogous to those of Feynman and Dyson are developed, so that the matrix element for a given process may be written down directly. The theory is made relativistically covariant, invariant under charge conjugation, and invariant under changes in gauge of an external electromagnetic field by placing various restrictions upon the form function. These restrictions limit the form function to be a function of only three variables. It is shown that the non-local interaction gives results similar to those which would be obtained from a theory providing for the propagation of virtual particles from one point of the interaction to the other, with the form function merely giving the distribution in masses of these particles. As an example of the technique of making calculations with this theory, the second-order photon self-energy is computed. It is shown that a suitable choice of the form function may cause this energy to be finite but that it does not seem possible to cause it to vanish in a non-trivial manner. The various Green's functions used in the theory are defined in the appendix. (auth)

5889

CONNECTION BETWEEN FUSION THEORY OF BOSONS AND NONLOCAL FIELD THEORY. Satosi Watanabe. Phys. Rev. 91, 771-2(1953) Aug. 1.

The quanta of a pseudoscalar field and a vector field are considered as composite particles resulting from the fusion of a spinor particle and its antiparticle. If a pair of component fermions are performing relative motion, it is to be expected that the resulting boson field can be described as a kind of nonlocal field in the sense of Yukawa's theory (Phys. Rev. 77, 219(1950); 80, 1047(1950)). In the present paper the mathematical feasibility of such correlation of the fusion theory with the nonlocal field theory is demonstrated. (L.T.W.)

5890

NOTE UPON THE RELATIONSHIP BETWEEN SPIN AND STATISTICS IN THE THEORY OF ELEMENTARY PARTICLES. Dominique Rivier. Helv. Phys. Acta 26, 300-6 (1953) June 15. (In French)

The existence of a bond between the spin of elementary particles and the statistics which regulate them is a result of the relativistic invariance of the field theory describing the particles. The existence of a bond is used to introduce a principle of quantization, which states that the operators of the quantum theory, which correspond to the motion constants of the classic theory, form a representation of infinitesimal operators. (J.S.R.)

5891

CONSTRUCTION OF CONSERVATION EQUATIONS FOR NONLOCAL FIELD THEORIES. Christopher Gregory. Phys. Rev. 91, 770(1953) Aug. 1.

C. Gregory (Phys. Rev. 78, 479(1950)) found an operator identity which showed the existence of a nonlocal vector function N^{μ} satisfying a conservation equation $[P_{\mu}, N^{\mu}] = 0$. It is pointed out in the present note that this identity could be of use in constructing stress-energy-momentum tensors. (L.T.W.)

5892

RADIATIVE CORRECTIONS TO NUCLEAR FORCES IN PSEUDOSCALAR THEORY. K. A. Brueckner. Phys. Rev. 91, 761-2(1953) Aug. 1.

Brueckner, Gell-Mann, and Goldberger (Phys. Rev. 90, 476(1953)) pointed out that a simple subset of radiative corrections to the nucleon propagation function has the effect of strongly depressing nucleon pair formation in pseudoscalar theory with pseudoscalar coupling. The effects on meson scattering and nuclear forces are then pronounced. The present paper shows that these effects also appear in a simple way in a consistent formulation of the relativistic two-body problem. (L.T.W.)